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The Canadian Occupational Projection System

Canada

AN ANALYSIS OF THE MECHANICAL CONSTRUCTION SECTOR LABOUR MARKET

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I. INTRODUCTION

On September 15, 1982 a memorandum of understanding was signed by representatives of the Mechanical Contractors Association of Canada (MCAC), the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada (hereafter referred to as the U.A.) and the Canada Employment and Immigration Commission (CEIC). This human resource planning agreement had the overall aim of securing the efforts of the parties to ensure the continuing supply and quality of a skilled mechanical construction industry labour force and to minimize adjustment difficulties experienced by mechanical construction trades workers. In order to achieve this result, the agreement specified five objectives. These were (1) to encourage an improved level of human resource planning by individual firms and at the industry wide level; (2) to facilitate participation of the U.A. in human resource planning; (3) to encourage the achievement of equal employment opportunities through progressive employment practices; (4) to enable public programs to be applied more effectively in support of human resource planning, training, and progressive employment initiatives; and (5) to conduct a labour market analysis of the mechanical construction industry so that current and future labour market imbalances can be identified. The following report is intended to fulfill the latter objective, and thus to deliver on the portion of the agreement assigned to CEIC. Based on the analysis presented below and on subsequent discussions with the principal parties, it is expected that activities will be developed to address the issues raised.

This report provides an analysis of labour market conditions faced by the plumbing occupations in Canada and the provinces, and an examination of the characteristics of firms comprising the mechanical contracting industry. The statistics found in this paper are based on several sources: these include (1) a survey of the Canadian Locals of the U.A. which was conducted for the Canadian Occupational Projection System (COPS); (2) surveys of mechanical contractors carried out by the MCAC; (3) the annual Statistics Canada census of mechanical contractors; and (4) the COPS system.

This study follows an earlier work released in 1974 by the Joint National Manpower Committee. That study presented projections of employment and labour force, and on the basis of this and other evidence, made recommendations concerning geographic mobility, training, immigration and other matters of labour market adjustment. This report presents a more up-to-date perspective on these and other issues.

In section II of this report, the features of the occupational work force will be analysed: numbers, utilization, unemployment, inter-provincial mobility, and losses to attrition will be examined. Section III provides a profile of firms in the industry, including a look at volume of business, trade specialty, type of legal entity and other features. Section IV presents a projection of occupational demand using alternative assumptions regarding utilization.

As a general observation, the analysis of occupational labour markets is complicated by the lack of reliable and complete information. Consequently, the measurement of certain aspects of occupational supply and demand often must rely on indirect methods which may only provide indicators of those features under investigation. Labour market information regarding the plumbing occupations is more readily available than that for many other occupations, but many gaps exist - even when elaborate means of data collection are employed, as will become apparent. For this reason, in this report, considerable attention will be devoted to the sources of occupational data and the related methods of analysis that have been used and those that offer potential availability.

II. THE PIPING TRADES

At the present time, there are two principal sources of information regarding occupational stocks - the census and union membership data. In terms of accuracy, census occupational labour force estimates are undoubtedly very good; the principal difficulty lies in the occupational coding, which does not always correspond well with the occupational classifications used in industry. In the case of the piping trades, as the plumbing occupations are often called, the match is reasonably good. However, it should be noted that the CCDO/SOC (Canadian Classification and Dictionary of Occupations/Standard Occupational Classification) category (8791) used for the Census includes, with construction plumbers, pipefitters, steamfitters and sprinklerfitters, several categories of utilities maintenance occupations - sewer and water main maintenance, steam main maintenance, gas service helping, and sewer clearing. The numerical importance of these latter occupations should not be great when compaired to the total for the cateogry, however, at least on a proportional basis.

Union data, in a similar way, tend to accurately reflect membership levels, and generally reflect stocks of skilled workers. The main disadvantage with this source is that non-union labour stocks remain unreported and are in themselves very difficult to measure. This is a serious shortcoming, especially where union and non-union labour face significantly different labour market conditions. In the case of the piping trades, those employed in residential construction, often under non-union circumstances, are often influenced by different demand conditions and require different skills as compared to the piping trades in most non-residential settings.

2.1 Census Data

According to the results of the 1981 census, practitioners of the plumbing occupations (SOC 9791) were employed in a variety of industries across Canada, with the construction industry accounting for the largest share of the total (at 58.4%). Public administration, including municipal government ranks second (at 5.0%), followed by pulp and paper (4.4%), utilities including water distribution (2.3%), trade (2.1%), electric power (1.9%), gas distribution (1.9%), petroleum and gas extraction (1.7%), education (1.6%),

and iron and steel manufacturing (1.6%). Numerous other industries accounted for smaller shares.

Because of the differences in the industrial composition of the provincial economies, the industrial distribution of employment of the plumbing occupations varies from province to province. For example, the pulp and paper industry in New Brunswick accounted for 13.5% of all plumbing occupations employment in 1981. This figure for other provinces ranged from 8.3% in British Columbia to nil in the Prairie provinces. Similarly, in Alberta and Saskatchewan, oil and gas extraction accounted for 7.3% and 4.0% of the totals, respectively, but virtually none elsewhere. Appendix A contains a table showing the detailed breakdowns for each of the provinces.

As is shown on Table 1, in terms of percentage occupational growth over the 1951-1981 period, Alberta, Saskatchewan, British Columbia, New Brunswick and Newfoundland ranked highest. In absolute terms, Alberta, Ontario, British Columbia and Quebec experienced the greatest growth. On a national basis, decade to decade percentage growth was most pronounced in the 1951-1961 period. In these years, the plumbing occupations grew most rapidly in Saskatchewan. Most provinces continued to experience strong growth in the trade group in the 1961-1971 period, but a notable exception was Quebec, which saw a net decline. In the following decade, 1971-1981, Alberta and Saskatchewan saw considerable occupational growth, and in Quebec the piping trades work force resumed expansion; in Nova Scotia and Manitoba occupational stocks fell.

Census estimates of the number of persons comprising the piping trades work force dedicated to the construction industry are presented in Table 2. These figures differ from those found in Table 1 in that they exclude practitioners working in other than contract construction, thus excluding maintenance services, and own-account construction, where tradesmen are employed directly by a project owner, rather than by (or as) a general or sub-contractor. (The importance of own account construction should not be underestimated: it is estimated by Statistics Canada (Catalogue 64-201, 1985) that own account construction represents some 31% of the total of the

TABLE 1

LABOUR FORCE
PLUMBING OCCUPATIONS (SOC 8791)
All Industries

	1951	1961	1971	1981
Canada	29,531	37,567	44,820	52,810
Nfld.	501	626	840	1,070
P.E.I.	123	138	210	250
N.S.	1,272	1,367	2,270	1,665
N.B.	664	1,024	1,415	1,635
Que.	10,049	12,424	11,550	12,205
Ont.	10,926	13,282	16,405	17,230
Man.	1,114	1,550	1,920	1,620
Sask.	575	1,259	1,420	1,995
Alta.	1,847	2,673	4,110	8,720
B.C.	2,460	3,138	4,580	6,235
N.W.T.	54	86	105	185

Source: Decennial Census - Statistics Canada

value of all new construction in Canada in 1985, and 53% of the value of all repair construction in that year.)

Over the 1951-1981 period, similar growth patterns are evident for the piping trades work force in the construction industry as were noted above: the number of tradesmen available to the construction industry grew most rapidly in Alberta, Newfoundland, Saskatchewan, British Columbia, New Brunswick and Prince Edward Island. In absolute terms growth was greatest in Alberta, Ontario and British Columbia. In Quebec, no net change occurred over the period despite a considerable increase in the 1951-1961 decade.

The overall pattern of occupational growth - highest in the three western-most provinces, especially in Alberta, and in Newfoundland and New Brunswick - was a result of industrial growth patterns. In central Canada, where the economy is more 'mature' development, was more complete by 1951.

TABLE 2

LABOUR FORCE
PLUMBING OCCUPATIONS (SOC 8791)
Construction Industry - (SIC 404-421)

	1951	1961	1971	1981
Canada	18,860	23,977	28,020	32,385
Nfld.	183	297	445	650
P.E.I.	83	107	165	215
N.S.	721	742	1,030	965
N.B.	395	505	815	955
Que.	6,693	8,270	7,300	6,705
Ont.	6,991	8,454	10,255	10,275
Man.	703	1,085	1,070	1,025
Sask.	394	894	915	1,395
Alta.	1,337	1,895	2,815	6,085
B.C.	1,360	1,728	2,865	4,045
N.W.T.	---	---	40	65

'---' indicates data are unavailable

Source: Decennial Censuses - Statistics Canada

The size of that part of the piping trades labour force which is dedicated to the construction industry, when expressed as a proportion of the total occupational labour force, is of interest for several reasons. First, this proportion, which can be termed the construction industry fraction, is an indicator of the intensity of industrial growth in a province. Where the construction industry fraction is high, industrial growth will tend to have been relatively more significant than otherwise. The construction industry fraction is also influenced by the size and composition of those industries, other than construction, employing the piping trades, and by the prevalence of own account construction. This has the effect of making inter-provincial comparisons less useful. The industry fraction can also be an indicator of the ease with which the labour force can adjust to varying levels of demand for construction over the business cycle. If the construction industry fraction is low, then when construction investment peaks, there will be a greater number of tradesmen, on proportional basis, working in other industries (or occupations) that may be drawn into contract construction activity. The construction industry fraction for

Canada and the provinces is presented on Table 3. These figures were obtained by dividing the entries of Table 2 by those of Table 1 and expressing the results as percentages.

TABLE 3

PLUMBING OCCUPATIONS LABOUR FORCE -
CONSTRUCTION INDUSTRY FRACTION
CONSTRUCTION INDUSTRY OCCUPATIONAL LABOUR FORCE
AS A PERCENTAGE OF TOTAL

Occupational Labour Force

Province	1951	1961	1971	1981
Canada	63.9	63.8	61.8	61.3
Nfld.	36.5	47.4	53.0	60.7
P.E.I.	67.5	77.5	78.6	86.0
N.S.	56.7	54.3	45.4	58.0
N.B.	59.5	49.3	57.6	58.4
Que.	66.6	66.6	63.2	54.9
Ont.	64.0	63.7	62.5	59.6
Man.	63.1	70.0	55.7	63.3
Sask.	68.5	71.0	64.4	69.9
Alta.	72.4	70.9	68.5	69.8
B.C.	55.3	55.1	62.6	64.9

Source: Canadian Occupational Projection System (COPS).

For Canada, the construction industry fraction shows little variation over time, declining very slightly from 64% to 61% from 1961 to 1981. Most of this decline occurred in the 1961-71 period.

Among the provinces, Newfoundland, New Brunswick and B.C. experienced the greatest growth in the construction industry fraction from 1961 to 1981. In the latter two provinces, this growth was much weaker in the 1971-81 decade. In Alberta, Saskatchewan, Manitoba, Ontario, and Quebec the construction industry fraction declined. Of all provinces, Quebec saw the greatest reduction by 17.5 % over the 20 year period. In the Prairie

Provinces, a decline in the 1961-71 period was partially offset by increases in the 1971-81 decade.

It should be noted that over the 1961-1981 period, the province to province variation in the construction industry fraction has declined, as measured by the range of values and by the standard deviation. (With the exception perhaps, of the experience in P.E.I. where the fraction rose from 77.5% in 1961 to 86% in 1981. These high figures are almost certainly due to the limited industrial variety in P.E.I.).

It should be noted that pipefitters in the shipbuilding industry are not included in the figures of Tables 1 or 2, and consequently are not accounted for by the construction industry fraction figures of Table 3. However, in those provinces with major shipbuilding industries, shipbuilding pipefitters may represent a significant source of supply to construction activity under some circumstances. Detailed analysis of this source of occupational supply would require further information.

2.2 Union Membership Data

A survey of U.A. locals was conducted for COPS in 1984. Appendix A shows the coverage achieved by the survey in terms of province, local union, and information category. Statistics, given below, relating to the U.A. are drawn from the results of the survey.

Journeyman membership among construction locals of the UA can be seen as representing the 'core' of the piping trades work force dedicated to the construction industry. Data regarding membership of journeyman plumbers, pipefitters, steamfitters and sprinklerfitters appear on Table 4; refrigeration mechanics and metal trades membership are also included. Data regarding membership within each member trade, broken down by journeyman/apprentice status are presented below.

TABLE 4

U.A. MEMBERSHIP DATA
JOURNEYMEN

	1978	1979	1980	1981	1982	1983
Canada	33,274	33,080	32,974	33,185	34,623	33,666
Nfld.	766	754	745	723	715	717
P.E.I.	46	50	71	67	68	70
N.S.	1,507	1,530	1,502	1,509	1,507	1,522
N.B.	1,412	1,477	1,537	1,587	1,599	1,596
Que.	6,024	5,693	5,406	4,681	4,611	4,637
Ont.	12,321	12,332	12,346	12,427	12,376	12,352
Man.	1,148	1,103	1,087	1,125	1,113	1,143
Sask.	504	509	533	603	609	629
Alta.	4,585	4,644	4,630	5,097	6,440	5,670
B.C.	4,909	4,936	5,067	5,324	5,553	5,291

Note: Includes Plumbers, Pipefitters, Steamfitters, Refrigeration Mechanics, Sprinklerfitters, Metal Trades.

Source: United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada.

U.A. journeyman membership, on a national basis, changed only slightly over the period; after declining marginally between 1978 and 1981, an increase of 4.3% occurred in 1981-1982, followed by a decrease of 2.3% the following year. In most provinces, the number of journeyman members over the period was fairly stable. The largest provincial changes occurred in P.E.I., where there was a 42% increase in 1979-1980, and in Alberta where membership jumped by 10% in 1980-81, 26% in 1981-82 and then dropped by 12% in 1982-83. In Quebec, membership fell by 13% in 1980-81 - the largest of four annual declines over the 1978-82 period.

An examination of the U.A. membership figures in Table 4 raises the question of how the U.A. membership levels compare with other measures of the occupational labour force which include both union and non-union components. Such a comparison is provided in Table 5, wherein 1981 census estimates of the piping occupations experienced labour force in all industries, and in the construction industry, are related to membership figures reported by the U.A. For such a comparison to yield useful

information, it is necessary that the union figures represent equivalent industrial attachment; if these were to represent construction (hiring hall) members only, then a valid comparison can be made with the census construction work force estimate. Accordingly, the U.A. was asked to report on the portion of its membership normally working in construction, as opposed to shipbuilding or other industrial settings. Thus, if the non-piping trades, in particular the refrigeration and metal trades are excluded from the membership counts, a comparison can be made with the census construction industry estimate (realizing that only a small portion of the membership in construction is involved in other than contract construction activity).

TABLE 5

COMPARISON OF CENSUS LABOUR FORCE ESTIMATES AND U.A. MEMBERSHIP STATISTICS 1981

	Census All Industries (1)	Census Construction Industry (2)	U.A. Membership All Trades (3)	U.A. Membership Piping Trades (4)	(4) Divided by (2) (5)
Canada	52,810	32,385	38,115	32,766	1.01
Nfld.	1,070	650	846	806	1.24
P.E.I.	250	215	92	92	0.43
N.S.	1,665	965	1,569	1,516	1.57
N.B.	1,635	955	1,859	1,633	1.71
Que.	12,205	6,705	4,868	4,298	0.64
Ont.	17,230	10,275	13,839	12,168	1.18
Man.	1,620	1,025	1,284	942	0.92
Sask.	1,995	1,395	899	872	0.63
Alta.	8,720	6,085	6,750	5,952	0.98
B.C.	6,235	4,045	5,960	4,443	1.10

Source: 1981 Census, Canadian Occupational Projection System.

Column 1 of Table 5 shows the 1981 census count of the piping trades work force in all industries by province. Column 2 presents similar figures, but for the construction industry only. Columns 3 and 4 show the U.A. membership 1981 figures for all trades and the piping trades,

respectively. Column 5 presents the provincial and national U.A. membership in the piping trades, expressed as a proportion of the census construction labour force estimate; that is, column 4 divided by column 2.

The results, varying from .43 to 1.71 suggest a number of possibilities. In order to check on whether those proportions well above 1.0 might be due to U.A. members in industries other than construction being included in the membership figures, recent statistics for the province of Ontario (which shows a proportion of 1.18) were obtained which show the coverage of U.A. collective agreements by industry. These figures indicated that, of all U.A. members covered by collective agreements, over 97% were engaged in construction. The remainder (2.8%) were employed in manufacturing (valves, plumbing fixtures, refrigeration equipment, boilers, etc.), education and service. This would indicate that there is no definitional mismatch between the two data sources. Another check was made by comparing the U.A. membership figure for B.C. with data collected by the B.C. provincial government in 1981. A close match was found for the piping trades, pointing to the same conclusion. So how can the 'high' U.A. membership among the piping trades be explained when compared to census construction industry occupational labour force?

When seeking information regarding an individual's recent employment, the census 1981 (long form) asked for specifics regarding the job held in the previous week, or if none, the job of longest duration held after Jan. 1, 1980. (If multiple jobs were held in the reference week, information was sought for that which accounted for most hours.) Respondents were asked to name the respective employer and the nature of the business. Using this information, Statistics Canada assigned industry codes to individuals' records.

Under certain conditions, the census may underestimate occupational supply. This could happen if circumstances require that individuals indicate on their census returns an occupation other than the one in which they would ordinarily work. In some regions within the Atlantic provinces there is a chronic lack of work in construction due to a lack of investment. Tradesmen in these regions seek other employment when unable to

work in construction, and at the time of the 1981 census some of these plumbers and pipefitters would have reported employment either in industries other than construction, or in occupations other than the piping trades. At the same time, however, many of these people may well have maintained membership in the U.A. In combination, these circumstances would lead to the situation observed on Table 5 for New Brunswick, Nova Scotia, and Newfoundland. A similar explanation may be valid for Ontario, which in 1981 was experiencing a decline in construction activity.

While estimates of occupational stocks derived from the census are nearly all-inclusive, the broad occupational categories used do not always provide the desired level of occupational detail. Membership data provided by the U.A. offers information regarding plumbers, pipefitters, steamfitters, sprinklerfitters, refrigeration mechanics and the metal trades. This sort of data can be very useful, particularly when augmented by additional information. For instance, when combined with the sort of demand projections provided below union membership data can be a valuable aid when planning the timing of major projects.

Construction membership statistics for the U.A. showing, on an annual basis, trade specialty and province for journeymen and apprentices are presented on Table 6A. It should be noted that the membership figures obtained from the U.A. combined the steamfitter category into the pipefitter specialty for the year 1983 - for all other years, 1978 through 1982, the two trades were treated separately. For this report, the number of steamfitter members was estimated using established patterns as a guide. These estimates of the number of steamfitter members appear in Table 6A and they are also used in the following analysis.

Nationally, in the five year period from 1978 to 1983, among U.A. members the number of journeymen plumbers rose by 7.4%. The number of pipefitters and sprinklerfitters rose by 1.0% and 4.5% respectively, while the number of steamfitters declined by 3.8%. The number of refrigeration mechanics and metal tradesmen both dropped, by 6.7% and 7.4% respectively, among the provinces. The number of journeyman members rose in B.C., Alberta, Saskatchewan, New Brunswick, and Prince Edward Island, remained roughly constant in Manitoba, Ontario and Nova Scotia and

TABLE 6A

U.A. Membership by Trade Specialty

PROVINCE	YEAR	PLUMBER		PIPEFITTER		STEAMFITTER		REFRIG		SPRINKLE		METAL		TOTAL	
		JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP
YUKON TERRITORY	1978	16	11	23	2	2	1	0	0	0	0	11	8	52	22
	1979	17	10	21	2	2	1	0	0	0	0	12	7	52	20
	1980	17	10	20	2	2	0	0	0	0	0	11	7	50	19
	1981	13	10	17	2	2	0	0	0	0	0	10	5	42	17
	1982	12	11	11	0	0	0	0	0	0	0	7	5	30	16
	1983	14	6	15	1	0	0	0	0	0	0	10	4	39	11
BRITISH COLUMBIA	1978	1656	305	1113	26	622	88	332	114	178	74	1008	34	4909	641
	1979	1694	248	1106	27	642	64	345	134	201	58	948	30	4936	561
	1980	1768	277	1121	36	658	70	368	148	204	66	948	28	5067	625
	1981	1881	275	1178	39	695	95	394	148	221	59	955	20	5324	636
	1982	1944	374	1261	42	687	134	394	124	226	94	1041	16	5553	784
	1983	1920	334	1130	32	615	104	398	131	220	79	1008	15	5291	695
ALBERTA	1978	1736	841	1499	195	747	104	125	110	87	121	391	73	4585	1444
	1979	1827	881	1387	173	778	101	122	107	97	124	433	67	4644	1453
	1980	1875	975	1331	148	779	101	113	120	103	138	429	72	4630	1554
	1981	2127	1057	1441	142	822	104	114	126	112	147	481	77	5097	1653
	1982	2667	1288	2106	216	906	153	162	97	115	161	484	83	6440	1998
	1983	2435	1127	1758	160	756	114	171	104	117	161	433	82	5670	1748
SASKATCHEWAN	1978	215	257	240	35	28	4	6	5	9	27	6	7	504	335
	1979	224	243	234	37	28	4	5	5	12	29	6	6	509	324
	1980	241	247	238	43	26	3	5	5	17	28	6	7	533	333
	1981	285	210	258	40	25	2	5	6	21	31	9	7	603	296
	1982	285	164	260	37	26	0	6	0	23	27	9	4	609	232
	1983	310	178	255	36	25	0	4	4	27	29	8	6	629	253
MANITOBA	1978	394	98	201	7	224	33	48	9	37	37	244	57	1148	241
	1979	368	88	192	6	218	39	41	7	43	25	241	59	1103	224
	1980	370	60	187	5	216	33	36	5	46	21	232	64	1087	188
	1981	353	49	233	5	206	32	34	4	48	16	251	53	1125	159
	1982	348	34	233	5	206	32	34	5	54	10	238	54	1113	140
	1983	359	44	239	5	211	35	37	6	49	19	248	56	1143	165
ONTARIO	1978	4890	790	2689	20	2953	578	647	258	353	261	789	129	12321	2036
	1979	4904	583	2640	16	3005	508	669	237	429	159	685	109	12332	1612
	1980	4877	579	2666	14	3034	470	673	234	449	143	647	104	12346	1544
	1981	4881	514	2658	14	3057	439	673	242	486	119	672	84	12427	1412
	1982	4856	511	2673	17	3084	454	679	246	485	117	599	57	12376	1402
	1983	4815	510	2637	17	3043	457	725	249	502	121	630	68	12352	1422

Source: United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the U.S. and Canada

TABLE 6A (Continued)
U.A. Membership by Trade Specialty

PROVINCE	YEAR	PLUMBER		PIPEFITTER		STEAMFITTER		REFRIG		SPRINKLE		METAL		TOTAL	
		JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP	JRN	APP
QUEBEC	1978	702	47	1493	12	2879	165	285	41	194	62	471	37	6024	364
	1979	638	34	1409	10	2739	127	269	34	179	48	459	41	5693	294
	1980	593	29	1323	10	2608	123	262	28	166	42	454	43	5406	275
	1981	515	23	1261	9	2367	92	43	6	26	5	469	52	4681	187
	1982	489	15	1272	8	2408	115	7	1	9	0	426	49	4611	188
	1983	499	15	1293	8	2447	115	15	2	9	1	374	46	4637	187
NEW BRUNSWICK	1978	377	114	778	63	76	19	20	14	18	42	143	65	1412	317
	1979	401	103	807	67	90	14	16	13	21	44	142	63	1477	304
	1980	404	108	833	67	117	17	18	9	24	41	141	57	1537	299
	1981	418	85	844	76	135	10	15	5	23	42	152	54	1587	272
	1982	425	73	835	75	141	8	13	2	26	32	159	44	1599	234
	1983	433	77	843	61	142	7	15	5	26	39	137	46	1596	235
NOVA SCOTIA	1978	529	111	672	73	135	14	13	5	45	56	113	26	1507	285
	1979	537	99	672	66	144	13	12	7	49	51	116	11	1530	247
	1980	530	92	655	39	139	11	11	8	51	49	116	9	1502	208
	1981	533	68	636	31	140	12	11	4	70	26	119	9	1509	150
	1982	524	67	642	23	140	16	12	5	69	19	120	9	1507	139
	1983	539	68	657	23	143	16	12	5	74	23	97	9	1522	144
PRINCE EDWARD ISLAND	1978	30	31	16	2	0	0	0	0	0	0	0	0	46	33
	1979	32	30	18	2	0	0	0	0	0	0	0	0	50	32
	1980	51	23	20	2	0	0	0	0	0	0	0	0	71	25
	1981	50	23	17	2	0	0	0	0	0	0	0	0	67	25
	1982	51	20	14	0	3	0	0	0	0	0	0	0	68	20
	1983	51	21	10	1	0	0	0	0	0	0	0	0	70	22
NEWFOUNDLAND	1978	281	106	444	39	6	1	2	1	8	14	25	9	766	170
	1979	278	85	432	45	7	0	2	1	13	8	22	9	754	148
	1980	268	75	428	35	8	0	2	1	12	10	27	8	745	129
	1981	253	66	422	34	8	0	2	2	12	11	26	10	723	123
	1982	254	52	411	30	11	0	2	4	12	14	25	9	715	109
	1983	256	55	428	20	0	0	2	3	12	14	19	6	717	98
CANADA	1978	10826	2711	9168	474	7672	1007	1478	557	929	694	3201	445	33274	5868
	1979	10920	2404	8918	451	7653	871	1481	545	1044	546	3064	402	33080	5219
	1980	10994	2475	8822	401	7587	828	1488	558	1072	538	3011	399	32974	5199
	1981	11309	2380	8965	394	7457	786	1291	543	1019	456	3144	371	33185	4930
	1982	11855	2609	9718	453	7612	912	1309	484	1019	474	3108	330	34621	5262
	1983	11631	2435	9263	366	7384	846	1379	509	1036	486	2964	338	33666	4980

Source: United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the U.S. Canada

declined elsewhere. Apprentice membership dropped in all provinces but British Columbia and Alberta and declined by 15.4% nationally.

The trades membership figures provided by the UA allow the calculation of the apprentice - journeyman ratios presented in Table 6B. Over the period from 1978 to 1983 these ratios span a range between 0% to 241%. The highest ratios are typically found in the sprinklerfitting and refrigeration trades. Of the piping trades, pipefitting and steamfitting display the lowest ratios. Among the provinces, Saskatchewan and Alberta generally experienced the highest ratios; this is of interest since, especially in Alberta, the trade was undergoing a rapid expansion over most of the period as a result of rapidly increasing requirements. Great demands were being placed on the training system. Given this, it may be valid to view the apprentice/journeymen ratios reached in Alberta over the period, and perhaps those experienced in Saskatchewan, as the maximum stable long term rate of training.

2.3 Utilization

In the construction contract industry, the nature of employment differs from the usual practice found in most other industries. Contractors bid, on a formal or informal basis, for construction jobs. Depending on its past success, at any given time, a firm may have several projects underway and may thus have a continuous flow of work over time. Most often however, individual tradesmen are employed, in the usual sense, only for the duration of a particular project. In the unionized portion of the industry, the union hiring hall acts as a labour exchange, rotating workers among jobs as they arise. Some tradesmen work on a self-employed basis as sub-contractors, and in this role, as well, employment is project by project.

As a result of these work patterns, over a given year a tradesman may work considerably fewer hours than a 'normal' work year of 1800 to 1900 hours. The duration of time spent not working will depend on the overall level of activity in the industry, which is determined by the level and pattern of investment in construction, and on the efficiency of the construction labour market at matching workers to project related jobs.

TABLE 6B

U.A. Apprentice - Journeymen Ratios

Apprentice Membership Expressed as a Percentage of Journeyman Membership

PROVINCE	YEAR	PLUMBER	PIPEFITTER	STEAMFITTER	REFRIG	SPRINKLER	METAL	TOTAL
YUKON TERRITORY	1978	68.8	8.7	50.0	0.0	0.0	72.7	42.3
	1979	58.8	9.5	50.0	0.0	0.0	58.3	38.5
	1980	58.8	10.0	0.0	0.0	0.0	63.6	38.0
	1981	76.9	11.8	0.0	0.0	0.0	50.0	40.5
	1982	91.7	0.0	0.0	0.0	0.0	71.4	53.3
	1983	42.9	6.7	0.0	0.0	0.0	40.0	28.2
BRITISH COLUMBIA	1978	18.4	2.3	14.1	34.3	41.6	3.4	13.1
	1979	14.6	2.4	10.0	38.8	28.9	3.2	11.4
	1980	15.7	3.2	10.6	40.2	32.4	3.0	12.3
	1981	14.6	3.3	13.7	37.6	26.7	2.1	11.9
	1982	19.2	3.3	19.5	31.5	41.6	1.5	14.1
	1983	17.4	2.9	16.8	32.9	35.9	1.5	13.1
ALBERTA	1978	48.4	13.0	13.9	88.0	139.1	18.7	31.5
	1979	48.2	12.5	13.0	87.7	127.8	15.5	31.3
	1980	52.0	11.1	13.0	106.2	134.0	16.8	33.6
	1981	49.7	9.9	12.7	110.5	131.3	16.0	32.4
	1982	48.3	10.3	16.9	59.9	140.0	17.1	31.0
	1983	46.3	9.1	15.0	60.8	137.6	18.9	30.8
SASKATCHEWAN	1978	119.5	14.6	14.3	83.3	300.0	116.7	66.5
	1979	108.5	15.8	14.3	100.0	241.7	100.0	63.7
	1980	102.5	18.1	11.5	100.0	164.7	116.7	62.5
	1981	73.7	15.5	8.0	120.0	147.6	77.8	49.1
	1982	57.5	14.2	0.0	0.0	117.4	44.4	38.1
	1983	57.4	14.1	0.0	100.0	107.4	75.0	40.2
MANITOBA	1978	24.9	3.5	14.7	18.8	100.0	23.4	21.0
	1979	23.9	3.1	17.9	17.1	58.1	24.5	20.3
	1980	16.2	2.7	15.3	13.9	45.7	27.6	17.3
	1981	13.9	2.1	15.5	11.8	33.3	21.1	14.1
	1982	9.8	2.1	15.5	14.7	18.5	22.7	12.6
	1983	12.3	2.3	16.4	16.2	38.8	22.6	14.4
ONTARIO	1978	16.2	0.7	19.6	39.9	73.9	16.3	16.5
	1979	11.9	0.6	16.9	35.4	37.1	15.9	13.1
	1980	11.9	0.5	15.5	34.8	31.8	16.1	12.5
	1981	10.5	0.5	14.4	36.0	24.5	12.5	11.4
	1982	10.5	0.6	14.7	36.2	24.1	9.5	11.3
	1983	10.6	0.6	15.0	34.3	24.1	10.8	11.5

Source: Canadian Occupational Projection System (C.O.P.S.)

TABLE 6B (continued)

U.A. Apprentice - Journeymen Ratios

Apprentice Membership Expressed as a Percentage of Journeyman Membership

PROVINCE	YEAR	PLUMBER	PIPEFITTER	STEAMFITTER	REFRIG	SPRINKLER	METAL	TOTAL
QUEBEC	1978	6.7	0.8	5.7	14.4	32.0	7.9	6.0
	1979	5.3	0.7	4.6	12.6	26.8	8.9	5.2
	1980	4.9	0.8	4.7	10.7	25.3	9.5	5.1
	1981	4.5	0.7	3.9	14.0	19.2	11.1	4.0
	1982	3.1	0.6	4.8	14.3	0.0	11.5	4.1
	1983	3.0	0.6	4.7	13.3	11.1	12.3	4.0
NEW BRUNSWICK	1978	30.2	8.1	25.0	70.0	233.3	45.5	22.5
	1979	25.7	8.3	15.6	81.3	209.5	44.4	20.6
	1980	26.7	8.0	14.5	50.0	170.8	40.4	19.5
	1981	20.3	9.0	7.4	33.3	182.6	35.5	17.1
	1982	17.2	9.0	5.7	15.4	123.1	27.7	14.6
	1983	17.8	7.3	4.6	33.3	150.0	33.6	14.7
NOVA SCOTIA	1978	21.0	10.9	10.4	38.5	124.4	23.0	18.9
	1979	18.4	9.8	9.0	58.3	104.1	9.5	16.1
	1980	17.4	6.0	7.9	72.7	96.1	7.8	13.8
	1981	12.8	4.9	8.6	36.4	37.1	7.6	9.9
	1982	12.8	3.6	11.4	41.7	27.5	7.5	9.2
	1983	12.6	3.5	11.2	41.7	31.1	9.3	9.5
PRINCE EDWARD ISLAND	1978	103.3	12.5	0.0	0.0	0.0	0.0	71.7
	1979	93.8	11.1	0.0	0.0	0.0	0.0	64.0
	1980	45.1	10.0	0.0	0.0	0.0	0.0	35.2
	1981	46.0	11.8	0.0	0.0	0.0	0.0	37.3
	1982	39.2	0.0	0.0	0.0	0.0	0.0	29.4
	1983	41.2	10.0	0.0	0.0	0.0	0.0	31.4
NEWFOUNDLAND	1978	37.7	8.8	16.7	50.0	175.0	36.0	22.2
	1979	30.6	10.4	0.0	50.0	61.5	40.9	19.6
	1980	28.0	8.2	0.0	50.0	83.3	29.6	17.3
	1981	26.1	8.1	0.0	100.0	91.7	38.5	17.0
	1982	20.5	7.3	0.0	200.0	116.7	36.0	15.2
	1983	21.5	4.7	0.0	150.0	116.7	31.6	13.7
CANADA	1978	25.0	5.2	13.1	37.7	74.7	13.9	17.7
	1979	22.0	5.1	11.4	36.8	52.3	13.1	15.8
	1980	22.5	4.5	10.9	37.5	50.2	13.3	15.8
	1981	21.0	4.4	10.5	42.1	44.7	11.8	14.9
	1982	22.0	4.7	12.0	37.0	46.5	10.6	15.2
	1983	20.9	3.9	11.5	36.9	46.9	11.4	14.8

Source: Canadian Occupational Projection System (C.O.P.S.)

Unemployment, or under-employment resulting from insufficient investment is termed cyclical (or demand-deficient) unemployment, while that resulting from a slow matching of jobs to workers is known as frictional unemployment.

The usual number of hours worked per year in contract construction can be significantly lower than the norm in other industries due to frictional factors. As well, significant year to year variations that can occur due to cyclical factors. It is therefore useful to measure the level of activity within a trade in terms of its utilization rate: defined as the average number of hours per year worked per worker. The concepts of labour shortage and labour surplus may be related to utilization rates by observing how this measure varies with changing levels of industry activity. Even at times of brisk investment activity, the frictional element of under-employment will still be present, but this will be offset, to some degree, by the prevalence of overtime. However, no matter how great the demand for labour, individual workers will still require some time off the job. There will thus be a limit on utilization which, in normal circumstances, will be approached but not exceeded. This limiting level of utilization can be viewed as representing somewhat more than full employment since it will involve as much overtime as is normally possible. As usually conceived, full employment would be related to that level of utilization above which overtime becomes the principal means of increasing the number of hours worked.

The notion of labour surplus, seen in terms of utilization rates, is more a matter of degree than a specific level. Even so, a utilization rate of 50% or 60% of that level reached during reasonably good times clearly represents a substantial underuse of the labour force.

In addition to the foregoing powers of description, the concept of utilization rate also provides a focus on the flexibility of a given 'supply' of labour. If the intensity of use of a given stock of labour were to rise this would have a similar effect to an expansion of the work force while maintaining the previous utilization rate. Thus, in the construction industry labour markets, there is a built-in slackness that is usually present in all but the busiest times - an 'unused supply'. The normal cyclical

swings in construction investment which occur over the years, can be met by a work force of roughly fixed size (or one that changes in size according to the long run trend in construction investment volume). Participants in these labour markets, of course, will see their incomes vary from year to year.

In the previous section it was noted that the census may underestimate occupational supply when occupational practitioners turn to other occupations during slack times - times when low utilization rates prevail. This implies that low measured utilization rates will underestimate the potential size of the occupational labour force, since as demand picks up, tradesmen will re-enter the industry (causing utilization rates to rise more slowly than expected). This concept is also related to the process of a changing construction industry fraction. As utilization rates fall during cyclical down turns, tradesmen will move to other industries. If these persons continue to work in the plumbing occupations then the result would be a decline in the construction industry fraction. This process would work in reverse as construction activity increases.

These observations point to the ambiguity of the concept of occupational stock as a measurement of labour supply in the construction trades: to a significant degree, even in the short run, demand (for trades labour) will create its own supply. This, in turn, suggests that, for the construction trades, estimates of occupational labour force stocks should be interpreted differently as compared to occupations with more 'normal' labour markets. It also suggests that occupational labour force stocks will be more difficult to measure.

It can be concluded from all of this that good data regarding utilization rates and their behaviour over the investment cycle is a definite requirement for a thorough analysis of a construction trades labour market. It will be seen below that for the piping trades, there is yet some distance to go in this regard.

Practical limitations on the availability of data presently limit the calculation of utilization rates to two methods, each having particular

strengths and weaknesses. The first means of approaching the measurement of utilization is through access to the records kept by union health and welfare plans. Using these data, the number of hours worked by members over a given year is divided by the annual average membership to yield the utilization rate. This source of information offers the advantage of strict accounting accuracy, but unfortunately difficulties are sometimes encountered as a result of the precise nature of the data collected by a welfare plan and the way that it is kept. For example, plans often base contributions on the number of hours earned by covered members, as opposed to the number of hours worked. When this occurs, the calculated utilization rate will overestimate the true figure. Another common difficulty occurs when a number of union locals covering several different trades participate in a single plan. Often in this circumstance, the administrator cannot provide hours and membership figures separately for each trade. Another limitation of this method may occur when measuring utilization during slack times. If union members accept non-union work under these conditions, as can happen, calculated utilization rates will be biased downward, since the number of hours reported as having been worked will be less than the actual figure.

A second method of estimating occupational utilization rates in the construction industry relies on census and Labour Force Survey data and the output of the COPS/Dalcor construction model. From these and other sources of data relating to flows into and out of the occupational labour force, it is possible to estimate the magnitude of the occupational stock available to construction activity in a given recent year. This estimate should take into account the effect of previous training, interprovincial in-migration, and sources of attrition such as retirements, deaths, accidents, out-migration and inter-occupational mobility. An estimate of the number of hours of work done by this pool of labour in a given year can be generated by the COPS/Dalcor model using the COPS technical coefficients and records of construction expenditure. This method of estimating utilization has the advantage of covering all construction work, union and non-union, and thus does not produce the biased results, discussed above, for those times when the industry is experiencing slack or especially busy conditions. However, because it is based on a ratio of dissimilar

estimates, it is subject to any differential error or bias that the estimates may contain. One particular problem inherent in this technique is brought about by the difficulty of measuring the extent of own-account construction work, and the size of the associated work force.

Utilization rate statistics provided by individual locals of the U.A. are presented in Table 7. Collection of this data was not uniform and considerable gaps exist. In addition, it is not clear whether all of the data reflect hours actually worked or hours earned.

TABLE 7

U.A. MEMBERSHIP UTILIZATION RATES
(Average Hours Worked/Year/Member)

Province	Local	1979	1980	1981	1982	1983
Nfld.	-	-	-	-	-	-
P.E.I.						
Plumbers	721	-	-	-	-	-
N.S.						
All Trades		233	56	-	-	1293
N.B.	-	-	-	-	-	-
Que..	-	-	-	-	-	-
Ont.						
Pipefitters	593	1244	1633	1646	1376	1780
Plumbers	593	1144	1591	1593	1503	1780
Steamfitters	787	1231	1633	1593	1503	1754
Refrig.	787	1563	1293	1721	1636	1584
Metal Trades	787	1800	1800	1800	1800	1600
Man.	-	-	-	-	-	-
Sask.	-	-	-	-	-	-
Alta.						
Plumbers	496	1320	1277	1740	1407	983
B.C.						
All Trades	170	-	-	1978	1662	961

Note: '-' indicates missing data

Source: United Association of Journeymen and Apprentices of The Plumbing and Pipefitting Industry of the United States and Canada.

Time series data are presented only for Ontario, Alberta, and B.C., and in the case of the latter two provinces, the effects of the recession are reflected in a substantial reduction in utilization rates in 1983. The information obtained from locals 593 and 787 in Ontario show utilization declining marginally in 1982, but demonstrating little of the effect seen in the western Canada. In terms of memberships and hours worked, these two locals saw only a relatively brief impact.

Utilization rates for the 1981-1983 period, calculated by the second method described above are shown on Table 8. These estimates, based on investment statistics, adjusted census data, and the output of the COPS/Dalcor model, show the effect of recession which affected the Atlantic provinces and central Canada in 1982, and the Prairie Provinces and B.C. in 1983. The very high utilization estimated by this method for B.C. and the Prairie Provinces in 1981 may be due to an over-estimate of the real value of construction actually put in place during that year, or to an under estimate of the industry work force (including non-union) as workers, some less skilled, migrated from other provinces or industries - lured by the prospect of high earnings, or by the widespread use of overtime. A significant portion of the movement of labour between provinces would have been temporary in nature, thus making the notion of provincial labour force 'stock' somewhat ambiguous.

TABLE 8

UTILIZATION RATE ESTIMATES
(Hours/Year)
Plumbing Occupations - Construction Industry

Region	1981	1982	1983
B.C.	2826	1923	1577
Prairie Provinces	2426	2214	1521
Ont.	1887	1590	1700
Que.	1556	1454	1548
Atlantic Provinces*	1756	1775	1387
Nfld.	1297	1095	1017

* - New Brunswick, Nova Scotia, P.E.I.

Source: Canadian Occupational Projection System (COPS).

Utilization rates for individual provinces within either of these areas, were not calculated because of the established patterns of interprovincial mobility within the Prairie and Atlantic regions.

Trends in construction trades utilization rates are closely reflected in unemployment as measured by the average number of claimants of unemployment insurance benefits over a given year. The effects of the decline in construction investment that occurred with the recent recession can be observed as a significant increase in the average annual number of claimants in the 1981-83 period. According to the annual data in Table 9, this was most pronounced in the three western-most provinces, where in the 81-82 period, there was at least a 100% increase in the number of claimants; in B.C. the number jumped by 243%. During this year, there was an increase in the number of plumbing occupations claimants in all provinces, with Newfoundland and New Brunswick being least affected (with increases of 14% and 23% respectively). Increases in the other provinces ranged from 71% in Manitoba to 31% in P.E.I. In the 1982-83 period the number of U.I. claimants in the piping occupations again rose, particularly in Alberta where the figure increased by 137%. In P.E.I. and Manitoba the number fell. In the 1983-84 period, declines were occurring in 6 of the 10 provinces, ranging from -22% in Manitoba to -30% in Newfoundland; however, in Alberta the number increased by 26%, and in P.E.I. and Saskatchewan it rose by 20% and 14% respectively. In the year from 1984 to 1985 the number of claimants fell in all provinces, contributing to a decrease in the Canada total of 20.3%. Table 9 also displays annual U.I. claims statistics for the period from 1978 to 1985.

The size of a labour market can affect the efficiency with which tradesmen are allocated to projects. In predominately rural regions a few ordinary construction projects will ordinarily provide the bulk of the contract construction industry employment at any given time. This relative 'lumpiness' of investment and employment will result in a less efficient job matching process as tradesmen spend a greater proportion of their time

TABLE 9

UNEMPLOYMENT INSURANCE CLAIMS
(Annual Averages)
Plumbing Occupations

	1978	1979	1980	1981	1982	1983	1984	1985
Canada	8983	7620	8140	7301	11584	16052	16313	13002
Nfld.	549	455	449	582	664	665	643	575
P.E.I.	51	43	59	74	97	93	112	100
N.S.	532	393	640	600	816	916	876	778
N.B.	466	340	497	701	861	1065	953	819
Que.	2769	2392	2374	1915	2912	3355	3053	2696
Ont.	2344	2459	2303	2019	2700	4147	4238	3322
Man.	264	191	254	215	368	354	277	273
Sask.	181	139	153	138	303	397	453	351
Alta.	740	511	899	591	1265	2992	3783	2584
B.C.	1088	699	513	466	1599	2069	1909	1505

Source: Canadian Occupational Projection System.

between jobs. The same influence will effect more developed regions if a sufficiently large proportion of total trades employment in contract construction is derived from mega-projects. The effects of these inefficiencies will be seen in higher U.I. claimant levels perhaps, but not necessarily, on a seasonal basis, and in lower utilization rates.

In the past decade, immigration has been a source of declining importance for the construction trades in Canada. Table 10 presents recent immigration statistics for the plumbing occupations. Shortages that are expected to be temporary may be reason for application for the issuance of employment authorizations, as is evident from Table 10. Immigration is not expected to be an important contributor to the supply of the piping trades in the forseeable future, except in local areas where there is a continuing excess of requirements over available stocks.

TABLE 10

IMMIGRATION STATISTICS
(Annual Averages)
Plumbing Occupations

Year	Immigration Visas	Employment Authorizations
1978	160	14
1979	177	46
1980	224	37
1981	137	80
1982	175	54
1983	104	27

Source: Canadian Occupational Projection System (COPS).

2.4 Geographical Mobility

Inter-regional and inter-provincial mobility play an important role in the functioning of labour markets for construction occupations. Due to the nature of construction work, the geographic area comprising a local labour market for an occupation may span several provinces or regions, and may be national or even international in scope. Hence, depending on local conditions in the various provinces, a large project in, say, Northern Alberta may draw tradesmen from most other parts of the country. If the duration of work is short, such inter-regional moves will generally be temporary. But if a string of projects should create a long term requirement for non-local tradesmen, migration will tend to become more lasting as out of region workers establish permanent domiciles in the new location.

At present, there are two principal sources of occupational data on migration in the construction industry - trade union statistics and the 1981

census. The survey of U.A. locals conducted for COPS was intended to capture information regarding the annual number of transfers in and out of the local unions. As well, the number of temporary authorizations to work in local areas was sought. Table 11 presents these results.

The data do not indicate any particular patterns, although this is almost certainly due to the sparseness of the responses. As expected, considerable geographic mobility centers on Alberta where temporary and more permanent transfers are common. The effects of the recession on western Canada may be seen in the number of temporary authorizations involving Local 496 (Calgary) where, in the 1979-81 period, authorizations in exceeded those out, while in 1982 and 1983 this pattern reversed as the volume of unfinished work in that province wound down. Temporary authorizations also achieved significant levels in local 508 (Sault Ste. Marie) in 1981, 1982 and 1983. It can be concluded that more a complete data capture, particularly of temporary authorizations in and out of local areas would be of use in determining geographic mobility patterns.

The other presently available source of statistics on geographical mobility results from the 1981 census. The main disadvantage of these data is that occupational disaggregation is limited to 2-digit SOC categories - in this case, all of the construction trade occupations combined. Table 12 shows that province of residence in 1976 of construction tradesmen who resided in the various provinces at the time of the 1981 census. For example, of those living in Newfoundland in 1981, 45 lived outside of Canada in 1976, 1725 lived in Newfoundland, 5 in P.E.I., and so on. While the migration pattern shown on the table is not precisely that of the plumbing occupations, strong similarities probably exist. According to the table, in the 1976-81 period, flows to Alberta were most prominent, followed by flows to Ontario from Atlantic and western Canada. On the basis of the number of migrants as a proportion of provincial population, the Atlantic provinces, and especially Newfoundland were the most important donors, while Alberta and B.C. were the most important recipients. Not unexpectedly there was considerable movement between adjacent provinces, especially Alberta and B.C.

TABLE 11

ANNUAL TRANSFERS IN AND OUT OF U.A. LOCALS AND TEMPORARY WORK AUTHORIZATIONS

Prov.	Local	Year 1979			1980			1981			1982			1983		
		In	Out	Temp	In	Out	Temp	In	Out	Temp	In	Out	Temp	In	Out	Temp
P.E.I.	721	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.S.	56	0	6	0	0	3	0	15	10	0	4	2	0	2	4	0
	682	-	-	-	-	-	-	-	-	-	0	1	0	0	1	0
N.B.	772	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ONT.	819	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	593	0	0	0	0	0	0	0	1	0	0	2	0	0	1	0
	787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	508	1	0	9	0	1	17	3	0	478	4	0	726	0	1	322
ALTA.	488	38	0	0	33	0	0	71	0	0	85	0	0	64	0	0
	496	5	1	176I 150U	6	6	250I 110U	3	3	250I 110U	24	48	200I 350U	18	28	200I 2650U
B.C.	180	0	2	0	0	0	0	1	0	0	0	1	0	0	1	0
	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

'-' Denotes missing data; 'I' denotes temporary transfers in, 'U' denotes temporary transfers out.

Source: United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada.

TABLE 12

Migrants 15 Years and Over in Labour Force by Province of Residence 1981, Showing Province of Residence in 1976: Construction Trades Occupations

Province of Residence 1976

Province of Residence 1981	Outside Canada	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	YUKON	NWT	TOTAL
Newfoundland	45	1725	5	45	40	15	290	25	0	15	10	0	0	2215
PEI	25	0	440	10	40	25	75	0	0	40	20	0	0	675
Nova Scotia	145	65	10	2490	155	75	445	25	10	210	55	5	0	3690
New Brunswick	215	50	10	120	2270	200	405	15	5	40	60	0	5	3395
Quebec	1000	30	0	40	105	25575	690	15	20	85	80	0	20	27660
Ontario	4615	475	35	435	365	1570	37565	365	100	595	635	30	10	46795
Manitoba	465	45	0	50	30	35	355	3405	125	255	145	10	20	4940
Saskatchewan	295	80	5	80	30	85	455	610	5815	975	490	5	30	8955
Alberta	3165	935	295	1515	1350	2690	10790	2585	2520	16945	4360	115	290	47555
BC	2430	110	30	335	185	695	3410	1145	660	3645	22185	175	85	35090
Yukon	15	5	0	10	5	20	55	20	5	75	140	80	25	455
NWT	15	20	0	15	20	40	95	40	20	75	40	10	165	555

Source: Statistics Canada, 1981 Census

There is no question that movements to and from Alberta have been the most significant patterns of inter-regional mobility over the past decade. Evidence of a reversal of the net direction of flow lies in Table 11, and even there it is ambiguous - Local 488 reported net inflow through 1983. It can, however, be speculated that more recent, and complete, data would confirm this movement. Because of their vintage, the data in Table 12 only reflect the movement of construction tradesmen to Alberta in the latter half of the 1970's decade. According to these figures, 64.4% of those construction tradesmen residing in Alberta in 1981 had moved there

from another province since June of 1976. This represents an example of a well functioning labour market that can adjust to changing patterns of demand. In this case there can be no question that the 'system' worked, and worked well.

2.5 Sources of Attrition to the Occupational Work Force

Implicit in any attempt to forecast occupational labour market conditions is a projection of the size and composition of the occupational work force over the forecast period. This latter task can be accomplished by adjusting a base period stock for the new additions expected over the period from sources such as training and migration, and for expected 'drop-outs' due to factors such as accident, death, retirement, and persons switching to other occupations. There are few good sources of occupational data for these substractive elements, especially for inter-occupational switches, potentially the most significant.

Inter-occupational mobility affects occupational stocks as people leave and enter a given occupation, to and from others. In the case of the plumbing occupations, the requirement for a fairly unique set of skills makes it difficult for the previously untrained to enter the piping trades work force. However, inter-industry movements of persons possessing piping skills, to and from the construction industry as construction industry activity rises and falls, can be significant.

The survey of the U.A. conducted for COPS sought information on the sources of attrition to the memberships of local unions. Table 13 summarizes the information provided by respondents. It should be recognized that the uneveness of reporting by local unions will tend to obscure those general patterns that may exist.

According to the survey returns, attrition to the work force due to accident was highly variable across locals. Locals 496 (Calgary, membership 2886 in 1983) and 170 (Vancouver, membership 4139 in 1983) reported significantly higher losses to the work force due to accidents than did others, but these locals 496 and 170 also had large memberships. (Note

TABLE 13

Sources of Attrition to U.A. Membership

Prov.	Local	Accident						Death						Retirement						Voluntary Withdrawal						Suspension					
		79	80	81	82	83	T	79	80	81	82	83	T	79	80	81	82	83	T	79	80	81	82	83	T	79	80	81	82	83	T
P.E.I.	721													1	1				2				3		1	4						
N.S.	56					3	3	6	5	4	8	3	26						10	17	13	21	29	43		20	20	20	30	22	
	682										3	3					2	4	6												
N.B.	772																								1						0
ONT.	819												13						14	13	18	6	2		39						
	593	0	0	0	0	1	1	2	0	1	3		6							14	14	12	10	3	53	55	61	56	53	66	291
	787							4	4	5	3	7	23	4	0	4	5	0	13	0	0	0	4	1	5	0	0	0	0	0	0
	508	0	0	0	0	0	0	0	1	2	2	1	6	3	0	2	1	2	8												
ALTA.	488							10	24	18	21	20	93	15	27	18	31	49	140	16	15	13	10	7	61	126	191	126	103	132	678
	496	60	67	74	80	85	366	5	10	6	16	12	49	9	11	8	7	15	50	3	2	5	3	7	20	40	182	126	146	160	654
B.C.	180					1	1				1		1							1					1	1	1		2	1	5
	170			36	36	43										29	46	61													

Source: Canadian Occupational Projection System (COPS).

that for local 170, accident and death figures are combined.) The data suggest the question of whether or not the nature of the responses is consistent between respondents. For example, did each local report permanent losses due to accident, or temporary losses?

Surprisingly, for most reporting locals, death appears to have been a more significant source of attrition than either accident or retirement. On a per capita basis the data provided by the responding locals indicate an annual death rate ranging from 0 to 1.8%; all but two yearly observations however, were less than 0.8%. No particular patterns were discernible.

Voluntary withdrawals and suspensions generally correspond to members switching to other occupations or regions or to the non-union work force. Suspensions usually occur as a result of non-payment of dues and this often happens when members turn to another occupation or industry. No distinct patterns are suggested by the data. Suspensions appear to be more important numerically in the western locals and local 787 (Refrigeration - Downsview, Ontario).

Another source of information on attrition to the occupational labour force can be found in the 1971 and 1981 census results. The idea here is that if, for a given occupation, the number of practitioners at, say, the age of 25 in 1971 is subtracted from the number at age 35 as revealed by the 1981 census, the resulting figure will give an indication of the net change in the number of occupational practitioners in this age cohort. In other words, the difference will be the net number of additions or reductions by age group. Thus on Table 14, the 1971 column shows the number of persons practicing the piping trades, by single year of age in that year, and the 1981 column shows similar data for 1981. Column 1 shows the 1971 figures but shifted 10 years in age: the 35 year figure in column 1 is the number at age 25 in 1971. Column 2 shows the result of subtracting column 1 from the 1981 column. This will show the net inflow or outflow in a given age cohort over the decade. When the figure is negative, it indicates a net outflow of persons in the particular age cohort. Similarly, a positive figure implies a net inflow into the occupation.

TABLE 14

CENSUS AGE COMPARISONS FOR CANADA
OCCUPATION 8791 PIPEFITTING, PLUMBING

	TOTAL			
	1971	1981	(1)	(2)
15 YRS	40	45	0	45
16 YRS	120	125	0	125
17 YRS	255	305	0	305
18 YRS	525	650	0	650
19 YRS	925	1170	0	1170
15-19 YRS	1865	2295	0	2295
20 YRS	1145	1590	0	1590
21 YRS	1330	1620	0	1620
22 YRS	1480	1645	0	1645
23 YRS	1710	1750	0	1750
24 YRS	1745	1665	0	1665
20-24 YRS	7410	8270	0	8270
25 YRS	1485	1875	40	1835
26 YRS	1375	1685	120	1565
27 YRS	1265	1635	255	1380
28 YRS	1280	1595	525	1070
29 YRS	1155	1530	925	605
25-29 YRS	6560	8320	1865	6455
30 YRS	1025	1500	1145	355
31 YRS	1190	1730	1330	400
32 YRS	1040	1605	1480	125
33 YRS	1100	1555	1710	-155
34 YRS	1035	1580	1745	-165
30-34 YRS	5390	7970	7410	560
35 YRS	1230	1470	1485	-15
36 YRS	1140	1295	1375	-80
37 YRS	1080	1255	1265	-10
38 YRS	1050	1110	1280	-170
39 YRS	1010	1100	1155	-55
35-39 YRS	5510	6230	6560	-330
40 YRS	1005	1160	1025	-135
41 YRS	1085	1060	1190	-130
42 YRS	1035	1070	1040	30
43 YRS	1005	1135	1100	35
44 YRS	945	910	1035	-125
40-44 YRS	5075	5335	5390	-55
45 YRS	965	970	1230	-260
46 YRS	975	970	1140	-170
47 YRS	885	880	1080	-200
48 YRS	810	1020	1050	-30
49 YRS	815	960	1010	-50
45-49 YRS	4450	4800	5510	-710
50 YRS	865	800	1005	-205
51 YRS	720	985	1085	-100
52 YRS	515	955	1035	-80
53 YRS	585	910	1005	-95
54 YRS	615	755	945	-190
50-54 YRS	3300	4405	5075	-670
55 YRS	545	775	965	-190
56 YRS	655	715	975	-260
57 YRS	545	645	885	-240
58 YRS	515	545	810	-265
59 YRS	455	675	815	-140
55-59 YRS	2715	3355	4450	-1095
60 YRS	495	560	865	-305
61 YRS	385	535	720	-185
62 YRS	380	310	515	-205
63 YRS	400	325	585	-260
64 YRS	325	300	615	-315
60-64 YRS	1985	2030	3300	-1270
65 YRS	130	90	545	-455
66 YRS	110	45	655	-610
67 YRS	80	70	545	-475
68 YRS	40	60	515	-455
69 YRS	40	30	455	-425
65-69 YRS	400	295	2715	-2420
70 YRS	60	30	495	-465
71 YRS	25	0	385	-385
72 YRS	10	0	380	-380
73 YRS	10	0	400	-400
74 YRS	15	0	325	-325
70-74 YRS	120	30	1985	-1955
75 YRS	5	0	130	-130
76 YRS	5	0	110	-110
77 YRS	0	0	80	-80
78 YRS	5	0	40	-40
79 YRS	5	0	40	-40
75-79 YRS	20	0	400	-400
80 YRS	0	0	60	-60
81 YRS	5	0	25	-25
82 YRS	5	0	10	-10
83 YRS	0	0	10	-10
84 YRS	0	0	15	-15
80-84 YRS	10	0	120	-120
85+ YRS	0	0	5	-5
TOTAL	44810	53335	44785	8550

(1) = 1971 AGED 10 YEARS
(2) = 1981 - (1971 AGED 10 YEARS)

Source: COPS

As year of age grows higher it is less and less likely that persons will enter the piping trades through the training system. This means that net losses indicated in column 2 more accurately approximate actual attrition levels as year of age increases going down the table. Conversely, in the lower age levels, negative figures in column 2 under-estimate actual attrition. It should be noted that his technique provides a general guide only, immigration, occupational re-entry, and other factors pose difficulties to the interpretation of these data.

Examination of the data in Table 14 and of similar statistics for other construction trades indicates that retirements from the piping trades begin early in comparison to, (for example, carpentry, glazing, roofing, and insulating). Significant age specific attrition is evident beginning in the early thirties and through the forties. As in most occupations, in the subsequent age groups, attrition is high.

Using the information presented in Table 14 it is possible to calculate a lower bound on occupational attrition over the 1971-1981 period. That is, it is possible to obtain an estimate of inter-censal attrition that will be an underestimate of the true value. The greater the influence of occupational entry in the (say) post 35 year age categories from sources such as training, immigration, and occupational re-entry, the more this estimate will be biased downward. It is also possible, using a similar procedure, to project attrition to the occupational labour force over the 1981-1991 period using the assumption that the (estimated) age-specific attrition rates of the 1971-1981 period remain the case through 1991. This calculation yields an estimate of 20.4%, or 10,856 persons leaving the occupational labour force over the decade to 1991. This estimate would indicate that, over the projection period from 1986 to 1992, at least 6,512 persons will leave the piping trades in Canada. Any assessment of labour market equilibrium (that is, the balance or imbalance of supply and demand) will have to take this movement into account.

The data provide no explanation of the early age-specific attrition rates for the piping trades. It is not clear if health or accident conditions are a partial cause, but judging from the information provided by U.A. locals

they are probably not. Most ex-plumbers and ex-pipefitters probably go to other occupations for financial and other reasons, but further information and analysis is necessary for a better understanding of this phenomenon.

The implication of this pattern of early age-specific occupational attrition is that the work force turns over faster than in other trades. The industry thus must place greater demands on the various sources of occupational supply-particularly on training programs. Immigration and geographical mobility also assume added importance.

III. THE MECHANICAL CONTRACTORS

The profile of mechanical contractors presented in this section is based on two sources, the annual census of mechanical contractors undertaken by Statistics Canada, and two surveys of membership conducted by the Mechanical Contracting Association of Canada in 1980 and 1983. The results of the national census are published in Statistics Canada Catalogue 64-204; the M.C.A.C. surveys are described in several special reports produced by the Association.

Mechanical contractors construct assemblies involving pipework, sheet metal, and insulation. This work may include plumbing or piping, installation of sprinkler systems, heating systems, commercial refrigeration systems, environmental controls, and insulation. The work done by mechanical contractors is often done under subcontract to a general contractor. Aside from managers and administrators, mechanical contractors often employ clerical staff, drivers, supervisors, foremen, and tradesmen practicing plumbing, pipefitting, steamfitting, sprinklerfitting, refrigeration, sheet metal, insulating and welding. Of course the number of persons and range of occupations employed by a given mechanical contracting firm depend on the size of the firm and its specialties. Firms engaged in residential construction, and particularly those working on single family homes, duplexes, or semi-detached houses tend to be small. (Over one-half of these establishments grossed under $100,000 in 1983.) Those contractors engaged in non-residential building construction are typically somewhat larger (63.7% grossed $100,000, or more, in 1983). Those working in engineering construction tend to be larger yet (55.7% grossed over $250,000 in 1983), probably reflecting the scale and technical nature of jobs in that sector. Table 15 shows the relationship between firm size and construction type specialty.

Table 16 provides information on the type of legal entity - proprietorship, partnership, and incorporated company - in each of the provinces as reported in the 1983 industry census. From this table it can be seen that 55.5% of all mechanical contracting establishments were located in central Canada - 36.9% in Ontario and 18.6% in Quebec. B.C. had the third

TABLE 15

MECHANICAL CONTRACTING ESTABLISHMENTS -
TYPE OF CONSTRUCTION BY VOLUME OF BUSINESS
TYPE OF CONSTRUCTION
CANADA - 1983

Volume of Business ($000's)	Residential (Single, Duplex, Semi)	(%)	Residential (Triplex, Row, Apart.)	(%)	Non-Residential Building	(%)	Engineering	(%)
$10 - 24.9	1,862	(23.2)	145	(19.2)	384	(10.8)	4	(1.4)
25 - 49.9	1,536	(19.1)	157	(20.7)	463	(13.1)	32	(11.5)
50 - 99.9	1,927	(24.0)	109	(14.4)	440	(12.4)	18	(6.5)
100 -249.9	1,759	(21.9)	134	(17.7)	801	(22.6)	69	(24.8)
250 -499.9	619	(7.7)	100	(13.2)	484	(13.7)	32	(11.5)
500 -999.9	231	(2.9)	67	(8.9)	405	(11.4)	39	(14.0)
1,000 & over	89	(1.1)	45	(5.9)	567	(16.0)	84	(30.2)
TOTAL	8,023		757		3,544		278	

Source: Statistics Canada, Catalogue 64-204 (1983).

TABLE 16

MECHANICAL CONTRACTING ESTABLISHMENTS
BY TYPE OF LEGAL ENTITY
1983

	Sole Proprietorship	Partnership	Incorporated Company
Canada	5,635	581	6,386
Nfld.	51	9	79
P.E.I.	89	2	37
N.S.	220	2	151
N.B.	66	3	149
Que.	1,064	83	1,197
Ont.	2,301	219	2,124
Man.	333	47	274
Sask.	227	25	284
Alta.	364	87	1,031
B.C.	920	104	1,060

Source: Statistics Canada, Catalogue 64-204 (1983).

largest number (16.5%) followed by Alberta (11.8%), Manitoba (5.19%), Saskatchewan (4.35%), Nova Scotia (3.0%), New Brunswick (1.73%), Newfoundland (1.1%), and P.E.I. (1.0%).

On a national basis, incorporated companies and sole proprietorships were most numerous, representing 50.7% and 44.7% of the total, respectively. Unincorporated partnerships were much less common, at 4.6% of the total, probably reflecting the advantages of incorporation as compared to partnership as a firm grows larger.

There was some province by province variation in the proportion of provincial totals represented by the three legal categories. Alberta, New Brunswick and Newfoundland had relatively fewer sole proprietorships than other provinces (24.6%, 30.3%, and 36.7% respectively), while P.E.I., Nova Scotia, and Manitoba had rather more (69.5%, 59.0%, and 50.9% respectively). The proportion of partnerships ranged from a low of 0.5% in P.E.I. to 7.2% in Manitoba and ranged between 3.5% to 5.9% in Quebec, Ontario, Saskatchewan, Alberta and B.C. Given the fairly minor variation in the relative number of partnerships, the proportion of provincial totals represented by limited liability companies varied inversely to the relative level of sole proprietorships; Alberta, New Brunswick, and Newfoundland had proportionally, more limited companies (69.6%, 68.4%, and 56.8%) while P.E.I., Nova Scotia, and Manitoba had relatively fewer (28.9%, 40.5%, and 41.9%).

A crosstabulation of the number of firms in each province by the principal type of construction installed in 1983 is presented in Table 17. On a national basis, the majority (69.7%) of the census respondents listed residential construction as their principal market. Non-residential building and engineering construction were less commonly indicated (28.1% and 2.2%, respectively). P.E.I. had the highest proportional incidence of (principally) non-residential builders (32.03%) followed by Quebec and Alberta (30.5% and 30.2%), while Manitoba, Nova Scotia and New Brunswick had the lowest (at 19.0%, 21.5%, and 23.9% respectively). Not unexpectedly, Alberta was reported to have the greatest concentration of firms which primarily seek work in the engineering market, followed by B.C. and Ontario.

TABLE 17

MECHANICAL CONTRACTING ESTABLISHMENTS
BY PRINCIPAL TYPE OF CONSTRUCTION
1983

	Residential (Single, Duplex, Semi-Detached)	Residential (Triplex, Row, Apartment)	Non-Residential Building	Engineering
Canada	8,023	757	3,544	278
Nfld.	86	17	31	5
P.E.I.	56	25	41	6
N.S.	252	28	80	13
N.B.	141	14	52	11
Que.	1,430	175	714	25
Ont.	3,007	292	1,293	52
Man.	467	34	124	29
Sask.	334	36	145	21
Alta.	886	84	448	64
B.C.	1,364	52	616	52

Source: Statistics Canada, Catalogue 64-204 (1983).

The value of work done in 1983, by mechanical contractors, by principal type of construction is shown in Table 18. It can be seen that of the total value of all mechanical contracting work done in Canada, 37.5% was done in Ontario, 19.6% in Alberta, 19.0% in Quebec, 12.0% in B.C., 3.8% in Saskatchewan, 2.9% in Manitoba, 2.0% in Nova Scotia, 1.8% in New Brunswick, and 0.7% and 0.5% in Newfoundland and P.E.I., respectively. Nationally, non-residential building construction accounted for 55.9% of the value of all work done by mechanical contractors, while residential and engineering work represented 28.7% and 15.5% respectively. The value of non-residential building construction as a proportion of the provincial total was highest in P.E.I. (66.5%), Nova Scotia (60.8%), and Quebec (59.8%), and lowest in Newfoundland (46.3%), New Brunswick (47.2%), and Manitoba (48.7%). That proportion for engineering construction was highest in Alberta (29.4%) and Nova Scotia (27.7%), and lowest in P.E.I. (3.7%), Manitoba (5.1%) and Quebec (8.4%).

TABLE 18

VALUE OF WORK PERFORMED BY MECHANICAL CONTRACTORS
BY PRINCIPAL TYPE OF CONSTRUCTION
1983 ($ Millions)

	Residential (Single, Duplex, Semi-Detached)	Residential (Triplex, Row, Apartment)	Non-Residential Building	Engineering
Canada	978.3	304.4	2,498.1	690.9
Nfld.	8.4	6.2	15.1	2.9
P.E.I.	5.3	2.0	16.3	0.9
N.S.	19.2	5.5	54.0	10.1
N.B.	14.4	6.2	38.8	22.8
Que.	192.3	78.0	508.9	71.3
Ont.	400.7	105.3	970.2	202.6
Man.	47.7	8.6	67.2	6.6
Sask.	45.9	13.5	83.8	29.0
Alta.	126.9	42.5	449.2	257.6
B.C.	117.9	36.5	294.6	87.0

Source: Statistics Canada, Catalogue 64-204 (1983).

The distribution of establishments by volume of business in 1983 is shown in Table 19. Across Canada, only 12.1% of mechanical contractors had a business volume of greater than $500,000, indicating that smaller firm size was the norm. This is also evidenced by the fact that 36.4% did less than $50,000 worth of business in the year.

Table 20 presents the value of work done by mechanical contractors in 1983 by type of work. Nationally and provincially, plumbing work generated more revenue than any of the other work categories (29.1% of the Canada total), followed by sheet metal, wet heating and air conditioning, and process piping (at 15.3%, 13.5%, and 11.4%, respectively). Provincial patterns followed the national breakdown fairly closely, but a number of deviations can be noted. In Alberta and B.C., plumbing accounted for a lower proportion of the value of all work undertaken (at 25.0% and 27.9% for Alberta and B.C.), while Newfoundland and P.E.I. this category had the highest proportion (47.7% and 45.6%). Dry heat and gas piping revenue, as a proportion of the provincial total, was greatest in Manitoba (at

TABLE 19

MECHANICAL CONTRACTING ESTABLISHMENTS
BY
VOLUME OF BUSINESS
1983

	$10,000-24,999	$25,000-49,999	$50,000-99,999	$100,000-249,999	$250,000-499,999	$500,000-999,999	$1,000,000 and over
Canada	2,395	2,188	2,494	2,763	1,235	742	785
Nfld.	11	30	25	35	22	11	5
P.E.I.	27	51	9	28	3	7	3
N.S.	89	62	90	63	35	15	19
N.B.	20	24	52	68	15	20	19
Que.	33	298	511	624	245	166	167
Ont.	929	887	915	931	439	265	278
Man.	130	147	120	153	51	25	28
Sask.	83	86	82	139	62	47	37
Alta.	222	222	323	292	184	101	138
B.C.	551	381	367	430	179	85	91

Source: Statistics Canada, Catalogue 64-204 (1983).

12.1%) and least in P.E.I. (at 2.0%). In P.E.I., however, the value of work done on wet heating and air conditioning was, proportionally, considerably higher than in any other province (at 29.3% as compared to 10-15% in other provinces). The proportion of total provincial value represented by process piping was higher in New Brunswick, Alberta, Quebec, Nova Scotia, and Ontario (at 16.7%, 13.8%, 12.7%, 12.2%, and 11.9% respectively). In other provinces, this figure ranged from 0.6% (in P.E.I.) to 7.14% (in Saskatchewan). In Alberta, thermal insulation work was relatively more important than in other provinces (at 10.6% of the provincial total), reflecting the extent of chemical process construction in that province. This was further influenced by the fact that the early 80's construction boom was running down by 1983. Thermal insulation is usually done in the latter stages of a project, and with few new projects starting, thermal insulation work on existing projects represented an increased proportion of total work.

TABLE 20

VALUE OF WORK PERFORMED BY MECHANICAL CONTACTORS
BY
TYPE OF WORK
1983 ($ Millions)

	Plumbing	Dry Heat Gas Piping	Wet Heat Air Conditioning	Sheet Metal & Duct Work	Process Piping	Sprinkler System	Commercial Refriger-ation	Environ-mental Controls	Mill-wrighting & Rigging	Thermal Insulation	Other Trade Work
Canada	1,324.1	355.8	600.8	677.2	503.9	167.9	148.1	165.2	152.6	220.8	155.3
Nfld.	15.6	1.3	3.9	4.4	2.0	1.1	2.0	0.9	0.15	0.13	1.2
P.E.I.	11.2	0.5	7.2	3.0	0.15	0.5	1.3	0.05	--	0.14	0.5
N.S.	31.8	5.7	11.7	10.0	10.8	4.5	6.7	3.6	1.8	0.7	1.6
N.B.	26.7	2.1	10.5	9.3	13.7	3.2	2.8	2.7	5.6	2.0	3.7
Que.	283.2	54.8	93.2	127.2	107.7	29.8	42.4	28.1	31.6	34.0	18.6
Ont.	447.8	159.3	259.0	255.6	196.8	56.5	44.0	61.3	61.3	64.4	42.9
Man.	49.3	15.7	20.1	20.4	3.7	3.9	4.5	5.9	1.1	1.3	4.2
Sask.	59.9	14.7	22.3	29.0	12.3	7.1	3.9	6.8	3.8	4.6	7.9
Alta.	218.9	50.7	96.3	132.0	121.0	32.5	19.5	39.9	21.6	93.2	50.3
B.C.	149.6	51.1	76.5	86.4	36.0	28.7	21.0	16.0	25.6	20.5	24.5

Source: Statistics Canada, Catalogue 64-204 (1983).

Employment levels provided by mechanical contractors in 1983 are shown in Table 21. Total hours by wage earners, the number of salaried employees, and the number of owners of unincorporated businesses are shown.

TABLE 21

MECHANICAL CONTRACTING ESTABLISHMENTS
BY LEVEL OF EMPLOYMENT
1983

	Total Hours Worked by Wage Earners (000's)	Total Number of Salaried Employees	Total Owners and Partners*
Canada	81,668	15,579	6,797
Nfld.	646	117	69
P.E.I.	434	88	93
N.S.	1,965	368	224
N.B.	2,119	312	72
Que.	14,953	3,257	1,230
Ont.	29,943	5,654	2,739
Man.	2,254	534	427
Sask.	3,146	624	277
Alta.	17,544	2,628	538
B.C.	8,663	1,997	1,128

* Applies to unincorporated establishments only

Source: Statistics Canada, Catalogue 64-204 (1983).

In 1980 and 1983, the MCAC conducted surveys of its membership in order to determine the size, structure, and specialties of these firms, their expectations of technological change and its effects, and union/non-union status. In the 1980 survey, 82% of respondents indicated that they pursued commercial work, 65% did industrial work, 57% did some service and maintenance, and 50% did institutional work. Only 44% sought residential work. Although this is a somewhat different profile than that indicated by the 1983 Statistics Canada census of contractors, differences in the wording of the questions asked respondents tend to make invalid any direct comparison of the two breakdowns. However, many small firms engaged in residential construction are evidently not members of the MCAC. The distribution of gross annual earnings, as reported in the 1983 MCAC survey, is presented in Table 22.

TABLE 22

GROSS ANNUAL EARNINGS OF MCAC MEMBERS FIRMS
RESPONDING TO A SURVEY OF MEMBERSHIP - 1983

Earnings ($)	Percentage	Earnings ($)	Percentage
Less than 100,000	2.8	1,000,000 - 2999,99935	35.2
100,000 - 249,999	5.6	3,000,000 - 4999,99911	11.1
250,000 - 499,999	12.0	5,000,000 - 9999,9999	9.3
500,000 - 999,999	6.5	10 million and over	17.6

Source: M.C.A.C.

These figures contrast with the 1983 industry census results primarily in that smaller firms are under-represented in the MCAC membership and larger ones are over-represented: over 56% of the census respondents did less than $100,000 business in 1983, while in the same year, 73.2% of the MCAC membership grossed over $1 million (assuming that the group of survey respondents was, in fact, representative of the entire MCAC membership).

The MCAC membership also differed from the national norm with respect to type of legal entity. According to the 1980 survey, 80% of the MCAC respondents were incorporated, 11% were sole proprietorships and 9% were partnerships. The industry census of that year reveals that of the national total, 51% were incorporated, 45% were sole proprietorships and 4% were partnerships.

The MCAC, in its 1980 survey, sought information regarding the background characteristics of the management of member firms. Fully 72.7% of the company heads of firms responding to the survey had at one time worked as journeymen. Those who did not share this background generally had university exposure. Of the total responding, 71.6% company heads had attended high school; about half of these graduated. The MCAC concluded that, as a rule, those who had attended high school went on to apprenticeship programs and hence acquired technical rather than

management backgrounds: the piping trades have been the principal training ground for managers of mechanical contracting firms.

The MCAC also collected information on other management team members. The second-to-the-top member typically had a similar educational background to the company head. The third management level indicated a greater high school graduation rate than achieved by company heads, but otherwise similar educational experience.

3.1 Technological Change

In its survey of membership conducted in 1983, the MCAC asked firms to indicate which of a list of new materials and techniques was thought to be coming into increased use. Although a majority of a respondents did not provide comment, the items thought to be most increasing in popularity were electronic and computerized controls. Upgrading of heating systems, energy audits and use of plastic piping were indicated only slightly less often as areas of increasing importance in the industry.

In terms of the effects on training and skills, the respondents indicated that new piping and joint material, followed by mechanical and electronic controls were the most significant pending changes. Upgraded skills were felt to be needed for the increasing demand for welded gas fittings and use of stainless steel piping; the use of new types of control systems was also felt to require upgrading or retraining of the existing work force. Another question, identified the following innovations as requiring new skills - energy audits, computerized drawings, computerized welding, and planning and scheduling.

MCAC members were asked to indicate what new trends were expected within the industry. Slightly less than one half of the respondents provided comment. The following items were suggested: energy conservation techniques, dual licenses covering both plumbing and fitting, new waste disposal techniques, calibration and start-up techniques, and safety and building operations systems.

IV. PROJECTIONS OF LABOUR MARKET CONDITIONS

The development of COPS was intended to provide individuals and organizations with information relating to past, present and future occupational labour markets. A major portion of the COPS system consists of a model which projects demand conditions for some 500 occupations distributed over 69 industries on national and provincial levels. The basic approach compares census occupational and industrial labour force and employment data with industry output statistics. These relationships are then used to convert projected industry output levels into projections of occupational requirements. In order to provide an idea of supply conditions over the projection period, information is collected regarding the various sources of expected new entrants - including education, immigration, etc. - and the sources of attrition to the labour force - which would include deaths, retirements, and geographical and occupational mobility. This methodology is quite satisfactory for most industries, but the construction industry labour market is not particularly well suited this sort of model. For this reason a separate model, dedicated to the construction industry, was developed by COPS.

Work on the COPS construction model has progressed in several steps. The first stage, which has been completed, entailed the development of a system which projects occupational requirements by province and by structure type. The demand model, in essence, is quite simple - estimates of the number of man-hours needed to complete one million dollars (1981 $) work of construction of a particular type are multiplied by the expected level of investment (in units of (1981) $ millions) in the particular construction category. This calculation yields an estimate of the number of man-hours needed for that category. The calculation may be summarized as:

$$\left(\frac{\text{Man-hours}}{\text{(1981) \$ million}} \right) X \quad \text{(Total investment in (1981) \$ million)} = \text{Man-hours required}$$

This computation is performed for each occupation in each structure type. The data requirements are thus: (1) projected annual investment figures by structure type, by province, and (2) the number of man-hours required for a unit value of construction by structure type, by occupation, by province. Information regarding projected annual investment is available from a number of sources - COPS uses a projection prepared by Informetrica Ltd. The second data requirement poses greater difficulties. Estimates of the man-hours required per unit value of construction, known as technical coefficients, were developed for COPS. These data were derived from a variety of sources including records of actual construction projects, engineering firms, contractors, and associations. Effort was made to ensure that the coefficients would be accurate representations of construction practice over the projection period (1986-1992).

For each of the construction occupations, a coefficient was derived for each of the following structure types:

A. Building Construction

1. Residential
2. Factories
3. Mine Buildings
4. Other Industries
5. Warehouses
6. Office Buildings
7. Other Commercial Building
8. Schools
9. Hospitals
10. Farm Buildings
11. Communications
12. Other Buildings NES

B. Engineering Construction

1. Marine
2. Roads and Runways
3. Sewage Treatment
4. Waterworks
5. Other Water
6. Dams
7. Generating Plants
8. Other Power
9. Railway
10. Telephone and Communications
11. Oil and Gas Wells
12. Refineries
13. Gas Plants
14. Pipelines
15. Mine Shafts
16. Bridges
17. Other Engineering NES

The COPS construction sector model offers projections of occupational requirements for any single construction category or for any combination. In addition, the impact of a single proposed project may be estimated.

The approach used for the COPS construction model offers the advantage of allowing the estimation of changes in occupational labour requirements due to shifts in the sectoral composition of the total volume of construction. The sectoral make-up can vary significantly over time as the business and investment cycle progress and this can often have an important impact on the mix of trades needed by contractors.

The cyclical fluctuations in construction investment will usually differ for each province and, as experience shows, will change in character as the years progress. Spending on residential, non-residential building, and engineering construction often follow differing cycles, contributing to the instability of the relationship between total investment in construction and the requirements for a particular trade, and thus of the inadequacy of any model based on that relationship.

The complexity of these investment patterns clearly complicates the task of projecting future levels. The procedure that has been adopted involves the preparation of a set of assumptions regarding major features of the economy that are expected to prevail over the projection period. Included in these assumptions are predictions of major aspects of government fiscal and monetary policy, of international issues (for example, of energy price trends), and of whether or not certain very large construction projects will proceed, and if so, when. These underlying assumptions are then made the basis of an econometric projection of a set of economic variables.

It is important to realize that many major swings in economic performance are due to factors that are not compatible with existing econometric forecasting capabilities, for example, the oil price shocks of the mid and late 1970's. These resulted from decisions or actions which were, in essence, political and were not predictable using an economic model. Nonetheless the economic impacts of these events, the recessions of 1974-1975 and 1981-1983, were considerable. The projections presented below, therefore, unfortunately do not account for the possibility of such events in the future, despite their importance.

The underlying assumptions used for the projection presented below center on expectations for lower oil prices over the next several years. It is assumed that the OPEC price for crude oil (in U.S. $) will average around $15 to $16 in 1986 and will generally rise to $21 in 1989 and then to $26 in 1992. This pattern of price adjustment is expected to result in a decline in investment in oil and gas facilities of some 30% through 1987, followed by resumed growth, which is projected to reach 10% p.a. in 1990, moderating thereafter.

Inflation is expected to remain low, averaging 3.3%, and the Canadian dollar is expected to appreciate with respect to the U.S. dollar. Interest rates in the U.S. are assumed to decline over the near term; the long term U.S. industrial bond rate is expected to decline to around 10% in 1987 and to 9.5% by 1990.

On a national basis, growth in output over the remainder of the 1980's is expected to average about 3%, but the construction industry is expected to fare better than most, experiencing annual growth rates averaging between 4% and 5% over the period. The mining and utilities sectors are expected to generate particularly strong demand for new construction, as is the service sector, including finance, insurance, and real estate, and commercial services. Several hydro-electric generating projects are expected to commence during the forecast period and to provide significant employment.

Gains in personal incomes are expected to result in brisk residential construction through 1987, but in following years slowing family formation is expected to cause a gradual reduction in the quantity of new housing demanded.

In the 1986-1990 period, of the total of non-residential construction, mining is expected to contribute 26%, finance 17%, utilities 15%, transportation, storage, and communications 13%, and manufacturing 13%. This pattern is expected to persist through the following decade, but with even more emphasis on mining construction (30%).

Lumber exports are projected to decline at a rate of some 2% per year until the end of the decade, but pulp and paper sales abroad are expected to grow due to strong economies among Canada's trading partners. Manufacturing of durable goods, particularly of electrical products, is expected to show strength. It is assumed that North American and Asian auto producers will place additional manufacturing capacity in Canada.

In Atlantic Canada, lower petroleum and gas prices are assumed as having the effect of delaying the Hibernia project by two years, and the Venture project indefinitely. In Newfoundland, the impact of this slow-down is projected to be moderated by spending on hydro projects and other provincial construction. Housing construction in that province is not expected to increase due to the relative stability of the population.

In Prince Edward Island, limited public expenditures are expected to result in slackness in the construction industry. However, it is projected that private non-residential construction will experience moderate growth and assume increased relative importance. The financial industries and communications are expected to draw investment, growing by an average of some 5% per year through this decade. Residential construction in Prince Edward Island is expected to decline steadily over the period.

In Nova Scotia, the shelving of plans for the Venture project imply declining expenditures on construction over the projection period notwithstanding an assumed growth of some 11% annually in provincial government expenditures on municipal infrastructure improvement. Growth of auto and aircraft parts manufacturing should also spur construction activity. Residential construction is projected to decline over the remainder of this decade.

In New Brunswick, the pattern is expected to be similar, with government expenditures on construction dominating the activities of the industry. After the recent surge of private investment directed at industry modernization, other major expenditures are not presently foreseen. Residential construction is projected to remain weak.

Lower energy prices should have the effect of buoying the demand for the output of Quebec goods producing industries as well as lowering producers' costs. It is assumed that investment in manufacturing enterprises will be strong, particularly in the areas of autos, pulp and paper, and aircraft including helicopters. Refining and chemical plants are expected to draw funds despite the changes that have been occurring in these industries. Residential construction should be stimulated by lower interest rates and an improving employment picture.

Construction in Ontario will be influenced by strong product demand - especially by customers in the U.S., and by low interest rates and oil prices. It is assumed that automobile and auto parts manufacturing will draw heavy investment flows from domestic manufacturers and from Asian firms. Strong export demand is expected to be augmented by the strong consumer demand which is expected to result from the favorable employment situation in Southern Ontario. This should stimulate the demand for the products of other industries in the province, bringing about added investment. Electricity generating facilities are expected to continue to be a major user of the construction industry. Mining, particularly precious metals production is expected to be a recipient of investment despite the effects of heavy competition from abroad. As in the other provinces, this projection assumes considerable provincial spending in Ontario on municipal infrastructure improvement. Over the remainder of the 1980's, residential construction demand is expected to remain high as a consequence of rising incomes, low interest rates, and a growing population resulting, in part, from migration from Western Canada.

In Manitoba, it is expected that the development of new hydro power facilities will dominate construction activity over the projection period. The $2.4 billion Limestone project and the later $4.8 billion Conawapa project provide most of this influence. In addition to this, Manitoba's manufacturing industries should prosper, given continued strength in the U.S. economy. Housing starts should remain strong as a result of continued employment growth over the projection period.

The outlook for construction in Saskatchewan is mixed, being largely determined by the markets for the province's resource products. Some

energy projects may be delayed or cancelled as a result of low oil prices. It is assumed that the New Grade project will proceed on schedule, but that the Husky upgrader will experience a two year delay. It is expected that potash sales will be somewhat more active and that fertilizer production will be strong. Normal harvests are assumed, but sales may be affected by U.S. agricultural support policies. Steady, but slow growth of manufacturing activity is expected. Commercial construction should be active in Regina and Saskatoon, and, as in other provinces, municipal infrastructure improvement is expected to occur. Residential construction activity is expected to be variable.

In Alberta, a drop off of energy related investment is expected to slow the growth of the provincial product. However, as stated above, oil prices are assumed to rise in coming years, and by 1988 this is expected to result in renewed investment. However, as a consequence of reduced primary sector expansion, commercial and other non-residential construction is expected to remain slow, but of increased relative importance. Governments, the financial industries, and manufacturing should be the principal players in this sector. After 1988, energy related construction is projected to re-assume its previous importance. Residential construction activity is projected to remain slow over the projection period.

Over the 1986-1992 period in British Columbia, investment related to Expo 86 and its aftermath, and several large transportation projects are expected to dominate construction in the near term. Thereafter, relatively weak economic performance is expected. The municipal infrastructure rebuilding program is expected to be a positive influence. An oversupply of electricity generating capacity and continuing weak mineral prices should preclude these areas of activity from offering renewed demand for construction. The effectiveness of efforts in the U.S. to limit U.S. imports of Canadian lumber may determine the level of output - and therefore the level of investment - by the forest products industry. Housing construction is expected to decline.

4.1 Projections of Occupational Requirements

The techniques described above were used to generate the following projection of requirements for the piping trades in construction. This extrapolation of past trends, based on the assumptions presented above, is presented in two forms; the first, as Table 23, represent the expected needs of builders in terms of man-hours of trade labour, and the second, presented on Table 24 provides three alternative man-year equivalents.

On a national basis, the demand for the piping trades for construction purposes is projected to grow steadly through 1990, pausing in 1991 and resuming thereafter. Over the period from 1986 to 1992 the average annual growth rate is projected to be 4.0%. This rate of increase would see demand surpass 80.3 million man-hours in 1992. This compares to a level of 48.5 million man-hours reached in 1983, a time when the recession of the early 1980's had reduced construction investment. Over the near-term, 1986-1988, growth in occupational demand is projected to be stronger (6-8%) than in following years. This pattern results from the projection of similar trends for Ontario and Quebec, provinces which dominate the national figures by virtue of their size; other provinces, notably Alberta, show different employment profiles.

Of all provinces, Newfoundland is projected to enjoy the greatest rate of growth in demand for the plumbing occupations, averaging some 12.2% annually over the period from 1986 to 1992. Within this trend however, there is considerable variation: in the 1986-1988 period demand growth is seen as being very strong, at over 20% per year. In 1988-1989 growth is projected to dip to 9.0%, and then to rise to over 23% in 1989-1990, falling in the subsequent year to 11.8%. In 1991-1992 demand growth is projected to fall by some 9.2%.

Saskatchewan and Alberta rank next in terms of rate of occupational employment expansion, with average annual growth rates of 8.5% and 7.1%, respectively. In Saskatchewan after a virtually flat situation in 1986, growth increases to reach 20.2% in 1989 and then is projected to decline to 12.3% in 1990 and to 1.5% in 1991. In Alberta, the assumed rebound in oil

TABLE 23

CONSTRUCTION SECTOR EMPLOYMENT PROJECTION
(In Man Hours)

Occupation : PLUMBERS — Structure : CONSTRUCTION INVESTMENT - GRAND TOTAL

PROVINCE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labr.	843362	694232	634344	627492	634839	725151	873823	1059135	1154781	1426180	1594527	1447453
Prince Edward Is.	151436	142025	188045	190257	219442	248104	240725	256148	255107	254761	263801	264237
Nova Scotia	1966244	1851728	1592371	1523091	1911965	1932360	1907570	1877934	1917771	1968155	1990409	2113623
New Brunswick	1631212	1707904	1103705	1105485	1374305	1530506	1590552	1749287	1857697	2046078	2086119	2111969
Quebec	10432303	9383892	9255714	11768665	12778897	15297080	17088608	18198623	18778353	18540690	17725611	18081522
Ontario	19393539	15790610	15635435	17911459	22470157	26032724	27966317	30675294	31988996	31961117	31418200	31940290
Manitoba	2008465	1438050	2025084	2159520	2750386	2903030	3329903	3607472	3668304	3887975	3991168	4150618
Saskatchewan	2053598	1784147	1937796	1720974	2177750	2509618	2502608	2661324	3079492	3702588	4159451	4094408
Alberta	16566587	16089355	9980956	6573689	7853734	5838058	5151488	5680020	6400541	6597519	7351564	8814583
British Columbia	11430365	7664964	6153915	5614018	5996981	6588113	7108266	7380514	7463967	7611386	7217624	7295572
TOTAL	66477112	56546906	48507365	49194650	58168456	63604744	67759859	73145752	76565009	77996350	77798473	80314275

Source : C.O.P.S

prices is evident toward the end of the projection period, when in 1991 occupational employment is projected to grow by 19.9%.

Occupational demand growth in Manitoba and New Brunswick is projected to average 6.1% and 5.5%, respectively on an annual basis. In the former province, occupational growth is strong at the beginning of the projection period (at nearly 15%) but tapers off (unevenly) thereafter. In New Brunswick, occupational growth peaks in 1989, reaching just over 10% and declines to 1%-2% through the remainder of the period.

Ontario and Quebec are projected to experience medium levels of growth in occupational demand, at 3.5% and 2.8% annually, respectively. In Ontario, growth in occupational requirements is moderate through 1988, but turns negative (at -0.2% and -1.7%, respectively) in 1989 and 1990, and resumes slow growth in 1991. In Quebec, the situation is similar, but with a slightly greater dip in 1989 and 1990.

Table 24

CONSTRUCTION SECTOR EMPLOYMENT PROJECTION

(In Man Years)

Occupation : PLUMBERS — HIGH UTILIZATION — Structure : TOTAL CONSTRUCTION

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	1100	767	631	577	570	577	659	794	963	1050	1297	1450	1316
Prince Edward Is	900	168	158	209	211	244	276	267	285	283	283	293	294
Nova Scotia	1000	1966	1852	1592	1523	1912	1932	1908	1878	1918	1968	1990	2114
New Brunswick	1200	1759	1423	920	921	1145	1275	1325	1458	1548	1705	1739	1760
Quebec	1500	6955	6256	6170	7846	8519	10198	11392	12132	12519	12360	11817	12054
Ontario	1900	10207	8311	8229	9427	11826	13701	14719	16145	16836	16822	16535	16811
Manitoba	1400	1435	1027	1446	1543	1965	2074	2379	2577	2620	2777	2851	2965
Saskatchewan	1200	1711	1487	1615	1434	1815	2091	2086	2218	2566	3085	3466	3412
Alberta	1400	11833	11492	7129	4695	5610	4170	3680	4057	4572	4713	5251	6296
British Columbia	1300	9793	5896	4734	4318	4613	5068	5468	5677	5742	5855	5562	5612
TOTAL		45194	38533	32622	32490	38226	41445	44018	47389	49654	50865	50945	52633

Occupation : PLUMBERS — MEDIUM UTILIZATION — Structure : TOTAL CONSTRUCTION

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	900	937	771	705	697	705	806	971	1177	1283	1585	1772	1608
Prince Edward Is	800	189	178	235	238	274	310	301	320	319	318	330	330
Nova Scotia	800	2458	2315	1990	1904	2390	2415	2384	2347	2397	2460	2488	2642
New Brunswick	1000	1631	1708	1104	1105	1374	1531	1591	1749	1858	2046	2086	2112
Quebec	1300	8025	7218	7120	9053	9830	11767	13145	13999	14445	14262	13635	13909
Ontario	1600	12121	9869	9772	11195	14044	16270	17479	19172	19993	19976	19636	19963
Manitoba	1000	2008	1438	2025	2160	2750	2903	3330	3607	3668	3888	3991	4151
Saskatchewan	1000	2054	1784	1938	1721	2178	2510	2503	2661	3079	3703	4159	4094
Alberta	1100	15061	14627	9074	5976	7140	5307	4683	5164	5819	5998	6683	8013
British Columbia	1100	10391	6968	5594	5104	5452	5989	6462	6710	6785	6919	6581	6632
TOTAL		54875	46876	39557	39152	46137	49808	52849	56907	59647	61155	61342	63455

Occupation : PLUMBERS — LOW UTILIZATION — Structure : TOTAL CONSTRUCTION

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	800	1054	868	793	784	794	906	1092	1324	1443	1783	1993	1808
Prince Edward Is	600	252	237	313	317	366	414	401	427	425	425	440	441
Nova Scotia	700	2809	2645	2275	2176	2731	2761	2725	2683	2740	2812	2843	3019
New Brunswick	800	2039	2135	1380	1382	1718	1913	1988	2187	2322	2558	2608	2640
Quebec	1100	9484	8531	8414	10699	11617	13906	15535	16544	17071	16855	16114	16427
Ontario	1400	13853	11279	11168	12794	16050	18595	19976	21911	22849	22829	22442	22814
Manitoba	900	2232	1598	2250	2399	3056	3226	3700	4008	4076	4320	4435	4612
Saskatchewan	800	2567	2230	2422	2151	2722	3137	3128	3327	3849	4628	5199	5118
Alberta	900	20709	20112	12476	8217	9817	7298	6439	7100	8001	8247	9189	11018
British Columbia	900	12700	8517	6838	6238	6663	7320	7998	8201	8283	8457	8020	8106
TOTAL		67698	58151	48329	47157	58534	59475	62983	67711	71979	72913	73283	76103

Source : C.O.P.S

British Columbia, Nova Scotia, and Prince Edward Island are projected to see occupational growth of under 2% annually over the projection period. In B.C. occupational demand growth declines through 1988 (to just over 1%), rises slightly to 2.0% in 1989, and then turns negative (at -5.2%) in 1991, then weakly recovers in 1991 (at 1.1%). In Nova Scotia, following negative growth in occupational demand in 1986 and 1987, slow growth occurs until 1991 when activity picks up and demand grows by 6.2%. P.E.I. is projected to experience declining demand except in 1987, 1990 and 1991 when growth is expected to be 6.4%, 3.6%, and 0.2%, respectively. These projections of occupational requirements are illustrated in Figures 1, 2, and 3.

The projection of requirements figures can be converted from terms of man-hours to man-years if information is available regarding the occupational stock over the projection period. With these data, utilization rates may be calculated (by dividing the number of man-hours required by the available occupational stock) on the basis that the work available would be distributed among all piping trades practitioners. In order to project the stocks of available occupational labour over the forecast period, it is necessary to adjust a base year stock (say that existing in 1981) for new entrants from training, immigration and inter-provincial migration, and for attrition due to retirements, out-migration, and so forth. It was intended that information allowing this would result from the survey of U.A. locals, but the ultimate yield of data from that source has proved insufficient. Consequently, for the purpose of this report, an alternative means of presentation has been used for the projections appearing below.

Table 24 displays the requirements for the plumbing occupations consistent with each of three (high, medium, and low) utilization rate assumptions. The particular values of utilization for each province were selected so that the range would be likely to contain the actual values of utilization that will occur over the 1986-1991 period. The range chosen for some provinces is wider than for others, reflecting differing degrees of uncertainty. The requirements figures, specified in man-years (at the assumed rate of utilization shown in the first column), are shown for each province for the years 1981 to 1992. (Figures for 1981-1985 are based on historical invest-

CONSTR. SECTOR EMPLOYMENT PROJECTION

PIPEFITTERS/PLUMBERS

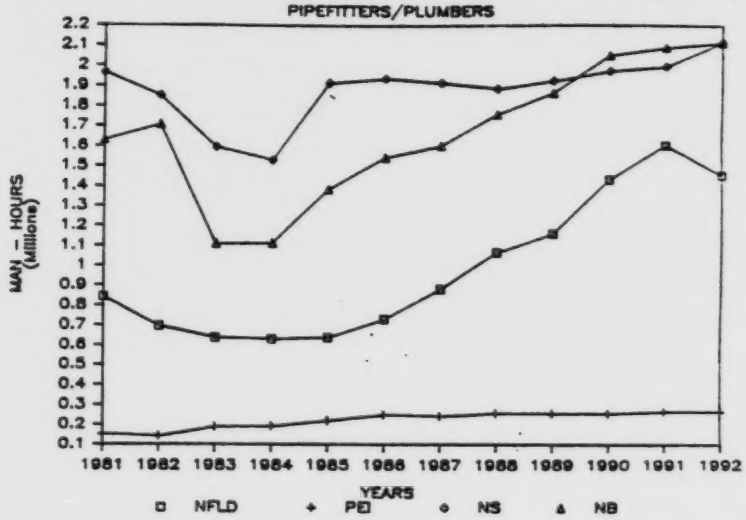

Figure 1

CONSTR. SECTOR EMPLOYMENT PROJECTION

PIPEFITTERS/PLUMBERS

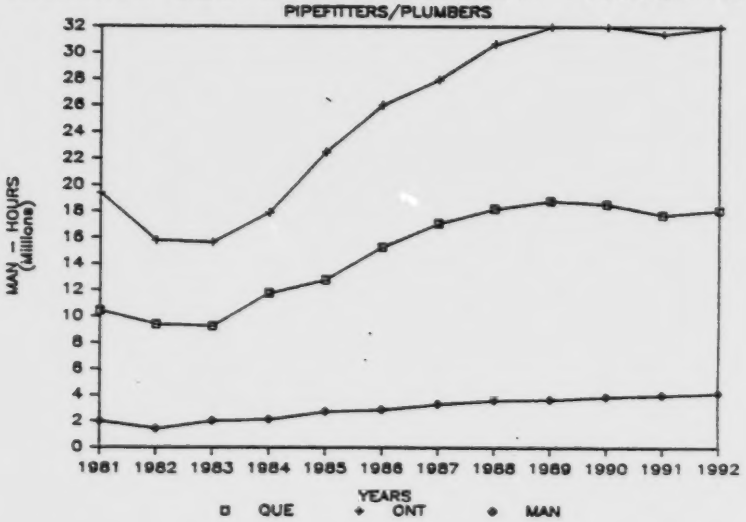

Figure 2

CONSTR. SECTOR EMPLOYMENT PROJECTION

PIPEFITTERS/PLUMBERS

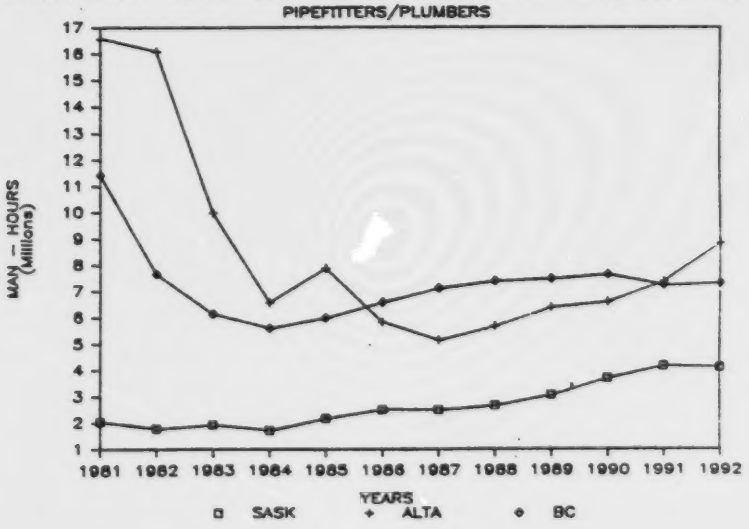

Figure 3

ment statistics.) Each of these requirement figures is calculated by dividing the number of man-hours required as shown on Table 23, by the assumed utilization rate for a province. For example on Table 24 the man-year requirement estimate (high utilization) for Newfoundland in 1986, 659, is equal to 725,151 divided by 1,100. Thus each requirement figure - in terms of man-years - is determined by the projection of construction activity and an assumed utilization rate. It should be realized that, for a given pattern of occupational requirements, the high utilization rate assumption is equivalent to a pattern of slow occupational labour force growth, while the low utilization assumption corresponds to more rapid work force expansion.

The tables may be used in several ways including use as an indicator of future demand and as a guide to planning, using desired, or normative, utilization rates as a target. As an indicator of future demand, Table 24 provides a range estimate of employment. If a user wishes to employ another estimate of utilization, a simple calculation such as that described above will be sufficient to provide an alternative to the figures shown on the table.

The second principal use of the tables is as a human resource planning aid. A natural question that arises during this sort of planning activity is: what is the optimum or desired level of supply? If this level is to be determined by some targetted level of utilization then, according to the employment projections shown on the Table 24, that utilization rate at which requirements equal the size of the available piping trades work force will give the desired result. When using Table 24 in this way, if the target utilization rate falls outside of the range shown, extrapolation will be necessary.

A projection of non-residential requirements for the piping occupations is shown on Tables 25 and 26. This is presented in a similar fashion to that used for the projection of requirements for all construction: the level of demand in terms of trade man-hours are presented first, then these are converted to man-year requirements according to the same three sets of utilization rate assumptions.

On a national basis, the requirements for the plumbing occupations in non-residential construction are projected to grow by over 6.1% annually between 1986 to 1992. Growth is expected to be stronger in the period to 1989 (10.0% in 1986, 11.6% in 1987, and 7.5% in 1988), and slower thereafter with a dip in 1990 (3.6% in 1989, 0.3% in 1990, and 4.2% in 1991).

Table 25

CONSTRUCTION SECTOR EMPLOYMENT PROJECTION
(In Man Hours)

Occupation : PLUMBERS — Structure : NON - RESIDENTUAL - TOTAL

PROVINCE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labr.	605360	521943	374784	402793	370122	507308	656385	828107	916039	1077689	1141516	1069617
Prince Edward Is.	109420	113134	123888	110104	116724	134180	140288	159939	168116	171141	175183	172970
Nova Scotia	1558593	1488589	990526	955826	1094973	1156673	1193554	1275064	1357138	1453327	1495093	1565997
New Brunswick	1386213	1534395	695876	760088	939681	1056439	1140748	1279643	1397396	1570961	1615598	1666907
Quebec	7932883	7514566	6090330	8193965	8875018	10751471	12415121	13469691	13841347	13771189	13313361	13707635
Ontario	13337461	11256734	9370548	11242026	14285293	15777262	17349613	19571019	21147585	21684626	21649286	22102483
Manitoba	1118405	829442	607402	753429	878805	989363	1193858	1379595	1510586	1676759	1767760	1832660
Saskatchewan	1546359	1309394	1277411	1193698	1548928	1628645	1816140	1948716	2246658	2571165	2873016	2824542
Alberta	10779594	11614396	8722222	4829195	6007165	4138689	3883237	4542459	5333115	5495895	6029420	7256256
British Columbia	7142673	4909629	3413752	3341027	3858985	4273618	4700979	5190671	5447997	5825220	5380602	5547261
TOTAL	46016762	41093823	29606739	31782141	37975694	40463648	44489924	49645103	53365977	55297971	55440834	57746329

Source : C.C.P.S

Among the provinces, Newfoundland and Manitoba show the greatest growth in occupational demand due to non-residential construction (13.2% and 10.8% annually, respectively over the period). The year to year trend in these provinces is similar to that for Canada as a whole: growth is strong through 1988, but slows thereafter in fact, in 1992 growth in non-residential occupational demand growth is projected to be negative. Alberta, Saskatchewan, and New Brunswick should see requirements grow in the 8%-10% range, on an annual basis (9.6%, and 7.9%, respectively) Ontario, Nova Scotia, British Columbia and Prince Edward Island are projected to see non-residential occupational demand grow at slower, but still substantial rates over the period (at 5.8%, 5.2%, 4.4%, and 4.3%, respectively, on a year to year basis).

Table 26

CONSTRUCTION SECTOR EMPLOYMENT PROJECTION

(In Man Years)

Occupation : PLUMBERS — HIGH UTILIZATION — Structure : NON - RESIDENTIAL - TOTAL

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	1100	550	474	341	366	336	461	597	753	833	980	1038	972
Prince Edward Is	900	122	126	138	122	130	149	156	178	187	190	195	192
Nova Scotia	1000	1559	1489	991	956	1095	1157	1194	1275	1357	1453	1495	1566
New Brunswick	1200	1155	1279	580	633	783	880	951	1066	1164	1309	1346	1289
Quebec	1500	5289	5019	4060	5463	5917	7168	8277	8980	9229	9131	8876	9138
Ontario	1900	7283	5925	4932	5917	7519	8304	9131	10301	11130	11413	11394	11633
Manitoba	1400	799	592	434	538	628	707	853	985	1079	1198	1263	1309
Saskatchewan	1200	1289	1091	1065	995	1291	1357	1513	1624	1872	2143	2394	2754
Alberta	1400	7700	8296	4802	3449	4291	2992	2774	3245	3809	3926	4307	5183
British Columbia	1300	5494	3777	2626	2570	2968	3287	3616	3993	4191	4481	4139	4267
TOTAL		31239	28058	19967	21010	24957	26462	29061	32399	34850	36273	36446	38004

Occupation : PLUMBERS — MEDIUM UTILIZATION — Structure : NON - RESIDENTIAL - TOTAL

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	900	673	580	416	448	411	564	729	920	1018	1197	1268	1188
Prince Edward Is	800	137	141	155	138	146	168	175	200	210	214	219	216
Nova Scotia	800	1948	1861	1238	1195	1369	1446	1492	1594	1696	1817	1869	1957
New Brunswick	1000	1386	1534	696	760	940	1056	1141	1280	1397	1571	1616	1667
Quebec	1300	6102	5780	4685	6303	6827	8270	9550	10361	10647	10593	10241	10544
Ontario	1600	8648	7035	5857	7026	8928	9861	10844	12232	13217	13553	13531	13814
Manitoba	1000	1118	829	607	753	879	989	1194	1380	1511	1677	1768	1833
Saskatchewan	1000	1546	1309	1277	1194	1549	1629	1816	1949	2247	2571	2877	3305
Alberta	1100	9800	10559	6111	4390	5461	3808	3530	4130	4848	4996	5481	6597
British Columbia	1100	6493	4463	3103	3037	3508	3865	4274	4719	4953	5296	4891	5043
TOTAL		37852	34094	24146	25244	30018	31676	34745	38763	41744	43485	43757	45584

Occupation : PLUMBERS — LOW UTILIZATION — Structure : NON - RESIDENTIAL - TOTAL

PROVINCE	UZ.RATE	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nfld. & Labrador	800	757	652	468	503	463	634	820	1035	1145	1347	1427	1337
Prince Edward Is	600	182	189	206	184	195	224	234	267	280	285	292	288
Nova Scotia	700	2227	2127	1415	1365	1564	1652	1705	1822	1939	2076	2136	2237
New Brunswick	800	1733	1918	870	950	1175	1321	1426	1600	1747	1964	2019	2084
Quebec	1100	7212	6831	5537	7449	8068	9774	11286	12245	12583	12519	12103	12461
Ontario	1400	9884	8041	6693	8030	10204	11269	12393	13979	15105	15489	15464	15787
Manitoba	900	1243	922	675	837	976	1099	1327	1533	1678	1862	1964	2036
Saskatchewan	900	1933	1637	1597	1492	1936	2036	2270	2436	2808	3214	3591	4131
Alberta	800	13474	14519	8403	6036	7509	5236	4854	5679	6666	6870	7537	9070
British Columbia	900	7936	5455	3793	3712	4288	4748	5223	5768	6053	6472	5973	6154
TOTAL		46580	42290	29657	30560	36377	37994	41538	46362	50006	52100	52512	54996

Source : C.O.P.S

The generally higher growth rates in occupational demand in non-residential, as opposed to residential construction bode well for U.A. members and most members of the MCAC. The demand for pipefitters and steamfitters should be somewhat stronger than that for plumbers as a result of the relatively strong demand projected for non-residential construction.

V. CONCLUSIONS

The following comments are intended to provide interpretation of the preceding projection with respect to labour market conditions over the 1986-1992 period.

Over the period, the figures of table 26 imply an increase in net requirements for the piping trades of some 26%, on a national basis. The bulk of this increase is projected to occur in central Canada, particularly in Ontario. All other provinces are to experience requirements growth according to this outlook, but in Alberta and B.C., this growth is projected to be slow, and over the projection period requirements are seen as being considerably below the levels experienced in the late 1970's and early 1980's.

The 26% increase in requirements projected for Canada is equivalent to some 9,900 man-years, calculated at a utilization rate of 1,400 hrs./yr. (This level of utilization will be exceeded in some provinces - most likely those in central Canada - and will not be achieved in others - most likely those on the east and west coasts.)

It should be recognized that given the present distribution of the piping trades labour force among the provinces, the emerging redistribution of requirements in most areas, could be largely met by adjustments of utilization. The great disparities in utilization rates that result, however, will encourage mobility between regions. This should amount to a reversal of the pattern of the 1970's in which many occupational practitioners moved to Alberta from central Canada and the Maritimes.

According to the projection, in Alberta, the difference in requirements between 1981 and 1989 amount to approximately 10 million man-hours, a drop of 61.4%. At the 1981 peak, utilization rates were in the neighbourhood of 2,000 man-hours per year. (Tables 7 and 8, taken together indicate this, given the biases that each would have when used to estimate utilization for the entire occupational labour force in construction.) This level of utilization and the difference in levels of requirements for 1981

and 1989 indicate that if a normative utilization rate of 1,400 hrs./year is achieved in 1989 then there would be a surplus of approximately 2,000 piping tradesmen in Alberta - some of whom will have left that province already (mid - 1986).

The third major factor to be considered when looking at potential labour market imbalances is the effect of occupational attrition over the forecast period. In Part I, this was estimated at at least 6,500 persons over the period from 1986 to 1992.

On a national basis, the overall implication of the projection is that by 1992, annual requirements for the piping trades should expand by some 16,400 man-years (9900 man-years, calculated at 1,400 hrs./year, due to increased demand, plus 6,500 man-years due to attrition). Offsetting this, a 'surplus' of some 2,000 tradesmen is projected to result in Alberta from the decline in construction activity that is presently occurring. This indicates a net additional requirement of 14,400 by 1992, assuming that a national average utilization rate of 1,400 hrs./year is to be maintained. If fewer persons enter the occupational labour market, then utilization rates will be higher.

The potential for tight labour markets is greatest in Ontario where an increase in requirements of approximately 65% is projected. The difference in the levels of 1981 and 1992, 12.5 million man-hours is equivalent to 7,380 man-years, calculated at 1,700 hrs./year. It should be noted that requirements in Ontario are projected to peak in 1989 and then to remain at approximately that level throughout the remainder of the forecast period. This would suggest that utilization rates in Ontario will also peak during 1989 and then decline as labour market adjustment mechanisms operate.

Principal among these mechanisms is apprenticeship training. As determined from the apprenticeship training statistics contained in Appendix C, over the ten year period from 1975 to 1984, 15,115 persons completed training in the piping trades in Canada. In the six year period from 1979 to 1984 there were 9,435 completions. If this volume of training were to continue throughout the projection period, the evidence presented above

indicates that by the end of this decade the national average utilization rate will rise and that in some localities, notably in Southern Ontario, the piping trades labour market will experience some tightness. This would, in turn, result in an increased interest in apprenticeship training which in combination with geographical mobility would act to eventually expand the labour force and bring utilization rates down to levels where overtime comprises a less significant component of total employment.

If apprenticeship training were to increase sooner, particularly in Ontario, less importance would ultimately be placed on other adjustment mechanisms. This would mean that less reliance would have to be placed on the widespread use of overtime and assisted mobility programs, both of which raise construction costs and correspondingly reduce the quantity of new construction actually purchased.

APPENDIX A

Appendix A

Percentage Distribution of Employment of the Plumbing Occupations (CCDO 8791) By Industry and Province 1981

INDUSTRY	CAN	NFD	PEI	NS	NB	QUE	ONT	MAN	SAS	ALB	
CONSTRUCTION WORKERS	58.453	52.767	79.185	51.981	51.25	51.3	56.326	63.118	55.907	69.276	62.1
EDUCATION	1.592	0.000	0.000	3.420	1.123	2.772	1.295	2.090	0.000	0.000	1.5
ELECTRIC POWER	1.943	0.000	0.000	2.488	3.806	0.000	4.161	0.000	1.244	0.000	0.0
FINANCE PAID WORKERS	0.000	1.097	1.958	0.000	0.000	0.000	0.000	1.014	0.000	0.000	0.0
GAS DISTRIBUTION	1.853	0.000	0.000	0.000	0.000	1.228	2.138	0.000	1.506	3.181	1.7
HOSPITALS	1.563	1.869	0.000	2.635	2.997	2.469	1.615	1.028	0.000	0.000	0.0
INDUSTRIAL CHEMICALS	1.407	0.000	0.000	1.377	0.000	0.000	2.442	1.100	0.000	1.392	0.0
IRON AND STEEL	1.585	0.000	0.000	1.281	0.000	1.624	3.242	0.000	1.228	0.000	0.0
METAL FABRICATING	1.024	0.000	0.000	0.000	0.000	1.184	1.266	2.211	0.000	0.000	0.0
MINING - METAL MINING	1.289	3.557	0.000	0.000	0.000	0.000	1.626	2.162	0.000	0.000	2.504
MINING-PETROLEUM-GAS WELL	1.698	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.954	7.318	0.0
MISC. SERVICES	1.041	0.000	0.000	1.240	1.973	0.000	0.000	0.000	0.000	1.969	0.0
MOTOR VEHICLES & TRAILERS	1.103	0.000	0.000	0.000	0.000	1.146	1.851	1.155	0.000	0.000	0.3
OTHER PERSONAL SERVICES	0.000	0.000	0.000	1.098	0.000	0.000	0.000	1.423	0.000	0.000	0.0
PETROLEUM & COAL PRODUCTS	1.349	0.000	0.000	2.253	0.000	1.183	1.408	0.000	0.000	2.386	0.0
PUBLIC ADMINISTRATION	5.043	12.590	10.906	12.166	6.723	6.566	3.604	7.809	5.749	3.211	4.1
PULP & PAPER	4.410	7.918	0.000	5.936	13.530	6.661	3.421	0.000	0.000	0.000	8.2
RAIL TRANSPORT	1.095	0.000	0.000	0.000	1.282	3.275	0.000	3.372	0.000	0.000	0.0
SHIPBUILDING & REPAIR	0.000	5.860	0.000	2.830	1.832	0.000	0.000	0.000	0.000	0.000	0.0
TRADE - PAID WORKERS	2.101	0.000	0.000	3.366	3.047	2.601	1.735	3.240	2.701	1.605	2.2
TRADE OTHER WORKERS	0.000	0.000	0.000	1.260	0.000	0.000	0.000	0.000	0.000	0.000	0.0
WATER & OTHER UTILITIES	2.275	8.025	5.646	1.596	3.419	1.221	2.595	3.336	3.928	1.540	3.3
WATER TRANSPORT	0.000	1.451	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0
WOOD	0.000	0.000	2.304	0.000	0.000	0.000	0.000	0.000	1.076	0.000	2.6
METAL MILLS	0.000	0.000	0.000	0.000	2.792	2.400	0.000	0.000	0.000	0.000	0.0
MISC. MANUFACTURERS	0.000	0.000	0.000	0.000	1.216	0.000	0.000	0.000	0.000	0.000	0.0
MACHINERY	0.000	0.000	0.000	0.000	0.000	0.000	2.211	0.000	0.000	1.106	0.0
MINING - NON-METAL MINES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.755	0.000	0.0

SOURCE : C. O. P. S.

APPENDIX B

SUMMARY OF RESPONSES TO U.A. SURVEY

			Membership			Nature of Data Provided		
Province	Local	J	A	Hours	Age	H.M.*	Geographical	Attrition
P.E.I.	721	67	19	X	-	-	-	X
N.S.	56	760	75	X	-	-	X	X
	682	360	26	-	X	-	X	X
N.B.	772	19	9	-	-	-	-	-
Ont.	819	120	11	X	X	X	X	X
	593	260	34	X	X	X	X	X
	787	730	206	X	X	X	-	X
	508	210	21	X	X	-	X	X
Alta.	488	5150	1012	X	-	X	X	X
	49	2115	771	X	-	X	X	X

* - Historical Memberships

Source: Canadian Occupational Projection System (COPS).

APPENDIX C

APPRENTICESHIP TRAINING STATISTICS

APPRENTICESHIP DATA
FOR PRINCE EDWARD ISLAND

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	60	58	64	56	56	57	54	49	52	48
REGISTERED DURING	19	25	10	24	15	16	5	10	1	8
DISCONTINUED DURING	9	11	5	9	9	8	2	2	4	10
COMPLETIONS	12	8	13	15	5	11	8	5	1	2
REGISTERED END	0	64	56	56	57	54	49	52	48	44
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	60	58	64	56	56	57	54	49	52	48
REGISTERED DURING	19	25	10	24	15	16	5	10	1	8
DISCONTINUED DURING	9	11	5	9	9	8	2	2	4	10
COMPLETIONS	12	8	13	15	5	11	8	5	1	2
REGISTERED END	0	64	56	56	57	54	49	52	48	44

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA FOR NEWFOUNDLAND

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER (INTER PROVINCIAL STANDARD)										
REGISTERED START	198	225	251	254	267	181	153	120	115	107
REGISTERED DURING	55	74	32	35	28	26	20	15	12	12
DISCONTINUED DURING	3	8	3	4	62	31	24	6	4	8
COMPLETIONS	25	40	26	36	52	23	29	14	16	14
REGISTERED END	225	251	254	249	181	153	120	115	107	97
8791-111 STEAMFITTER (INTER PROVINCIAL STANDARD)										
REGISTERED START	95	103	121	104	121	72	74	85	111	99
REGISTERED DURING	16	40	14	17	41	16	29	31	19	14
DISCONTINUED DURING	4	14	6	3	56	4	7	0	11	5
COMPLETIONS	4	8	20	15	34	10	11	5	20	17
REGISTERED END	103	121	109	103	72	74	85	111	99	91
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	293	328	372	358	388	253	227	205	226	206
REGISTERED DURING	71	114	46	52	69	42	49	46	31	26
DISCONTINUED DURING	7	22	9	7	118	35	31	6	15	13
COMPLETIONS	29	48	46	51	86	33	40	19	36	31
REGISTERED END	328	372	363	352	253	227	205	226	206	188

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA
FOR NOVA SCOTIA

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	326	334	372	353	290	286	274	238	204	176
REGISTERED DURING	136	128	90	61	96	74	70	66	51	44
DISCONTINUED DURING	58	20	42	54	42	13	39	39	25	28
COMPLETIONS	70	70	67	82	58	73	67	61	54	33
REGISTERED END	334	372	353	278	286	274	238	204	176	159
8791-121 SPRINKLER-INSTALLER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	0	0	16	43	50	45	27	24
REGISTERED DURING	0	0	0	30	27	14	3	10	8	0
DISCONTINUED DURING	0	0	0	0	0	7	8	7	1	0
COMPLETIONS	0	0	0	0	0	0	0	21	10	0
REGISTERED END	0	0	0	30	43	50	45	27	24	24
8791-111 STEAMFITTER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	159	202	238	226	194	159	187	130	98	108
REGISTERED DURING	84	87	44	29	39	43	23	22	48	32
DISCONTINUED DURING	19	14	23	51	0	10	24	23	6	21
COMPLETIONS	22	37	33	51	74	9	52	31	32	9
REGISTERED END	202	238	226	153	159	183	134	98	108	110
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	485	536	610	579	500	488	511	413	329	308
REGISTERED DURING	220	215	134	120	162	131	96	98	107	76
DISCONTINUED DURING	77	34	65	105	42	30	71	69	32	49
COMPLETIONS	92	107	100	133	132	82	119	113	96	42
REGISTERED END	536	610	579	461	488	507	417	329	308	293

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA FOR NEW BRUNSWICK

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER (INTER PROVINCIAL STANDARD)										
REGISTERED START	227	246	312	313	262	187	201	170	149	123
REGISTERED DURING	85	118	64	47	39	75	37	29	25	45
DISCONTINUED DURING	31	30	26	48	44	32	27	28	21	16
COMPLETIONS	35	22	37	66	70	29	41	22	30	14
REGISTERED END	246	312	313	246	187	201	170	149	123	138
8791-121 SPRINKLER-INSTALLER (INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	0	0	0	0	0	8	21	23
REGISTERED DURING	0	0	0	0	0	0	8	13	8	6
DISCONTINUED DURING	0	0	0	0	0	0	0	0	4	2
COMPLETIONS	0	0	0	0	0	0	0	0	2	0
REGISTERED END	0	0	0	0	0	0	8	21	23	27
8791-111 STEAMFITTER (INTER PROVINCIAL STANDARD)										
REGISTERED START	113	124	115	129	130	124	118	124	133	111
REGISTERED DURING	55	39	33	20	52	39	38	36	13	24
DISCONTINUED DURING	5	10	8	6	8	15	6	9	7	2
COMPLETIONS	39	38	11	13	50	31	26	18	28	24
REGISTERED END	124	115	129	130	124	117	124	133	111	109
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	340	370	427	442	392	311	319	302	303	257
REGISTERED DURING	140	157	97	67	91	114	83	78	46	75
DISCONTINUED DURING	36	40	34	54	52	47	33	37	32	20
COMPLETIONS	74	60	48	79	120	60	67	40	60	38
REGISTERED END	370	427	442	376	311	318	302	303	257	274

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA
FOR QUEBEC

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-111 *STEAMFITTER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	0	2,755	3,361	3,217	1,277	2,758	3,039	3,450
REGISTERED DURING	0	0	0	1,114	776	248	1,381	836	703	734
DISCONTINUED DURING	0	0	0	281	789	801	1	874	0	306
COMPLETIONS	0	0	0	328	345	249	9	396	292	208
REGISTERED END	0	0	0	3,260	3,003	2,755	2,758	2,039	3,450	3,670
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	0	0	0	2,755	3,361	3,217	1,277	2,758	3,039	3,450
REGISTERED DURING	0	0	0	1,114	776	248	1,381	836	703	734
DISCONTINUED DURING	0	0	0	281	789	801	1	874	0	306
COMPLETIONS	0	0	0	328	345	249	9	396	292	208
REGISTERED END	0	0	0	3,260	3,003	2,755	2,758	2,039	3,450	3,670

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA FOR MANITOBA

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	251	234	234	244	255	254	244	219	201	178
REGISTERED DURING	63	63	88	76	68	69	40	44	33	44
DISCONTINUED DURING	15	26	40	21	19	28	31	32	20	16
COMPLETIONS	65	37	38	46	50	53	34	30	36	35
REGISTERED END	234	234	244	253	254	242	219	201	178	171
8791-121 SPRINKLER-INSTALLER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	30	41	53	50	48	54	38	31
REGISTERED DURING	0	30	19	24	21	11	27	6	5	0
DISCONTINUED DURING	0	0	2	8	12	6	9	11	1	4
COMPLETIONS	0	0	6	4	12	7	12	11	11	7
REGISTERED END	0	30	41	53	50	48	54	38	31	20
8791-111 STEAMFITTER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	66	52	38	41	39	50	58	71	90	90
REGISTERED DURING	7	5	17	12	19	22	19	30	11	6
DISCONTINUED DURING	7	9	7	3	2	6	4	5	3	6
COMPLETIONS	14	10	7	11	6	8	2	6	8	12
REGISTERED END	52	38	41	39	50	58	71	90	90	78
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	317	286	302	326	347	354	350	344	329	299
REGISTERED DURING	70	98	124	112	108	102	86	80	49	50
DISCONTINUED DURING	22	35	49	32	33	40	44	48	24	26
COMPLETIONS	79	47	51	61	68	68	48	47	55	54
REGISTERED END	286	302	326	345	354	348	344	329	299	269

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA
FOR ONTARIO

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 *PLUMBER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	1,767	1,829	1,807	1,853	1,949	1,931	1,881	1,814	2,168	2,060
REGISTERED DURING	494	484	588	514	430	513	361	578	354	54
DISCONTINUED DURING	156	152	159	131	141	221	109	183	163	42
COMPLETIONS	276	354	383	293	307	342	319	41	299	105
REGISTERED END	1,829	1,807	1,853	1,943	1,931	1,881	1,814	2,168	2,060	1,967
8791-121 *SPRINKLER-INSTALLER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	291	296	302	299	271	208	124	87	110	119
REGISTERED DURING	65	47	43	22	12	14	9	34	25	9
DISCONTINUED DURING	37	26	26	14	21	19	8	9	7	1
COMPLETIONS	23	21	20	42	54	79	38	2	9	1
REGISTERED END	296	296	299	265	208	124	87	110	119	126
8791-111 *STEAMFITTER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	573	508	540	562	576	599	611	590	709	616
REGISTERED DURING	124	193	172	140	134	116	96	169	130	35
DISCONTINUED DURING	38	39	56	23	42	33	20	35	60	13
COMPLETIONS	151	122	94	67	69	76	92	20	158	33
REGISTERED END	508	540	562	612	599	606	595	704	616	605
8791-123 *GASFITTER*										
REGISTERED START	0	2	2	1	1	1	1	2	3	2
REGISTERED DURING	2	1	0	0	2	1	1	1	1	0
DISCONTINUED DURING	0	0	0	0	2	0	0	0	1	0
COMPLETIONS	0	1	1	0	0	1	0	0	1	0
REGISTERED END	2	2	1	1	1	0	2	3	2	2
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	2,631	2,635	2,651	2,715	2,797	2,739	2,617	2,493	2,990	2,797
REGISTERED DURING	685	725	803	676	578	644	467	782	510	98
DISCONTINUED DURING	231	217	241	168	206	273	137	227	231	56
COMPLETIONS	450	498	498	402	430	498	449	63	467	139
REGISTERED END	2,635	2,645	2,715	2,821	2,739	2,611	2,498	2,985	2,797	2,700

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA
FOR SASKATCHEWAN

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	267	287	353	416	567	550	576	545	520	465
REGISTERED DURING	91	109	108	241	114	101	129	101	77	93
DISCONTINUED DURING	57	35	33	41	79	32	81	43	62	44
COMPLETIONS	14	8	12	41	52	43	79	83	70	46
REGISTERED END	287	353	416	575	550	576	545	520	465	468
8791-121 SPRINKLER-INSTALLER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	0	0	0	0	0	0	14	26
REGISTERED DURING	0	0	0	0	0	0	0	14	13	12
DISCONTINUED DURING	0	0	0	0	0	0	0	0	1	7
COMPLETIONS	0	0	0	0	0	0	0	0	0	3
REGISTERED END	0	0	0	0	0	0	0	14	26	28
8791-111 STEAMFITTER										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	35	39	37	41	54	57	61	48	47	44
REGISTERED DURING	15	7	12	24	11	7	12	12	10	43
DISCONTINUED DURING	10	6	7	7	5	1	20	4	7	1
COMPLETIONS	1	3	1	4	3	2	5	9	6	8
REGISTERED END	39	37	41	54	57	61	48	47	44	78
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	302	326	390	457	621	607	637	593	581	535
REGISTERED DURING	106	116	120	265	125	108	141	127	100	148
DISCONTINUED DURING	67	41	40	48	84	33	101	47	70	52
COMPLETIONS	15	11	13	45	55	45	84	92	76	57
REGISTERED END	326	390	457	629	607	637	593	581	535	574

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA
FOR BRITISH COLUMBIA

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 *PLUMBER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	482	550	692	681	638	578	487	631	805	781
REGISTERED DURING	177	313	168	0	140	201	302	366	180	96
DISCONTINUED DURING	39	69	87	0	104	102	59	92	116	99
COMPLETIONS	70	102	92	148	141	138	99	103	90	122
REGISTERED END	550	692	681	625	533	539	631	802	779	656
8791-121 *SPRINKLER-INSTALLER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	61	59	82	62	80	70	56	79	98	110
REGISTERED DURING	24	56	13	0	4	25	33	37	25	1
DISCONTINUED DURING	6	21	29	0	0	2	5	3	5	5
COMPLETIONS	20	12	4	5	27	27	5	15	6	15
REGISTERED END	59	82	62	80	57	66	79	98	112	91
8791-111 *STEAMFITTER*										
(INTER PROVINCIAL STANDARD)										
REGISTERED START	284	279	308	263	268	279	262	334	386	401
REGISTERED DURING	100	133	22	0	60	93	134	108	82	11
DISCONTINUED DURING	85	28	31	0	10	9	7	11	15	22
COMPLETIONS	20	76	36	50	59	89	55	51	76	54
REGISTERED END	279	308	263	268	259	274	334	380	377	336
8791-123 *GASFITTER*										
REGISTERED START	2	4	3	10	12	9	9	12	22	13
REGISTERED DURING	2	4	7	0	6	5	9	18	3	1
DISCONTINUED DURING	0	5	0	0	9	4	6	7	11	6
COMPLETIONS	0	0	0	0	0	0	0	1	0	3
REGISTERED END	4	3	10	12	9	10	12	22	14	5
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	829	892	1,085	1,016	998	936	814	1,056	1,311	1,305
REGISTERED DURING	303	506	210	0	210	324	478	529	290	109
DISCONTINUED DURING	130	123	147	0	123	117	77	113	147	132
COMPLETIONS	110	190	132	203	227	254	159	170	172	194
REGISTERED END	892	1,085	1,016	985	858	889	1,056	1,302	1,282	1,088

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA

APPRENTICESHIP DATA FOR ALBERTA

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
8791-115 PLUMBER (INTER PROVINCIAL STANDARD)										
REGISTERED START	891	989	1,129	1,467	1,695	1,906	2,234	2,362	2,402	2,300
REGISTERED DURING	348	413	626	571	566	708	700	641	664	317
DISCONTINUED DURING	87	70	75	104	130	160	188	172	120	127
COMPLETIONS	163	203	213	184	224	220	384	447	646	520
REGISTERED END	989	1,129	1,467	1,750	1,907	2,234	2,362	2,384	2,300	1,970
8791-121 SPRINKLER-INSTALLER (INTER PROVINCIAL STANDARD)										
REGISTERED START	0	0	0	0	0	0	0	19	128	171
REGISTERED DURING	0	0	0	0	0	0	19	117	73	26
DISCONTINUED DURING	0	0	0	0	0	0	0	8	19	12
COMPLETIONS	0	0	0	0	0	0	0	0	11	19
REGISTERED END	0	0	0	0	0	0	19	128	171	166
8791-111 STEAMFITTER (INTER PROVINCIAL STANDARD)										
REGISTERED START	82	96	110	142	155	153	189	220	252	336
REGISTERED DURING	48	59	65	57	55	79	97	97	131	73
DISCONTINUED DURING	7	20	14	22	35	20	30	27	23	34
COMPLETIONS	27	25	19	17	22	23	36	39	24	63
REGISTERED END	96	110	142	160	153	189	220	251	336	312
8791-123 GASFITTER										
REGISTERED START	60	67	69	72	66	90	111	135	131	141
REGISTERED DURING	39	37	31	31	60	62	78	66	68	59
DISCONTINUED DURING	13	10	8	13	12	13	23	23	17	14
COMPLETIONS	19	25	20	25	24	28	31	47	41	58
REGISTERED END	67	69	72	65	90	111	135	131	141	128
TOTAL FOR PROGRAMS LISTED ABOVE										
REGISTERED START	1,033	1,152	1,308	1,681	1,916	2,149	2,534	2,736	2,913	2,948
REGISTERED DURING	435	509	722	659	681	849	894	921	936	475
DISCONTINUED DURING	107	100	97	139	177	193	241	230	179	187
COMPLETIONS	209	253	252	226	270	271	451	533	722	660
REGISTERED END	1,152	1,308	1,681	1,975	2,150	2,534	2,736	2,894	2,948	2,576

SOURCE: C.O.P.S. DATABANK, EMPLOYMENT AND IMMIGRATION CANADA